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AND THE RECORDING OF

AMERICAN AND OTHER PATENTED INVENTIONS.

SEPTEMBER, 1833.

The Pennsylvania Locomotive.

Communicated for this Journal.

Patents have been granted to Colonel Long, of the United States Army, for "certain improvements in the construction of locomotive and other steam engines," under the designation with which this article is headed. The numerous experiments which have been made by Col. Long, with the view of perfecting, and satisfactorily testing the efficiency of his improvements, have been attended with great expense, and have led to the most satisfactory results.

In this communication it is intended to explain some of the more prominent objects of Col. Long's improvements, and to conclude with a brief recital of some of the practical results accomplished by them.

1st. The successful application of anthracite coal as a fuel for locomotive engines, has been a leading object of the inventor. This object has been attained in the most satisfactory manner, by means of a furnace and boilers of a peculiar construction. The furnace is surrounded by water on all sides, in a manner similar to that adopted in the most approved English locomotive engines, but differs from the latter in the manner of attaching the fire box to the boilers, and in exposing a much larger comparative boiler surface to the direct action of the heat. The furnace is supplied with a grate of a peculiar construction, which may be made to oscillate at pleasure, on an axle provided for that purpose. By means of the movements thus communicated, the fuel may be speedily discharged from the fireplace, when-

ever occasion requires it; or may be shaken or agitated in such a manner as to prevent the coal from packing upon the grate bars, and thereby obstructing the requisite draft into the flues and chimney.

In addition to the fire box already mentioned, the boiler, or steam generator, consists of two or more cylindrical boilers placed horizontally and lengthwise of the engine. Each cylindrical boiler is furnished with tubular flues passing longitudinally through that portion of the boiler situated in rear of the fireplace. The heated air, flame, &c. is admitted into these flues through a niche in the cylinder prepared for this purpose, and is conducted through them into a smoke box and chimney situated at the back end of the boiler.

In addition to the tubular flues just mentioned, there is a broad and sufficiently copious flue situated beneath the cylindrical boilers, by means of which the heated air, &c. is brought into contact with the entire lower half, or exterior, of all the cylindrical boilers.

The very extensive boiler surface thus acquired and presented to the action of the heat, contributes to render the production of steam exceedingly copious, while the heat imparted by the fuel, is almost entirely absorbed in its production. Such is the efficiency of this arrangement, that in a boiler nine feet and eight inches long, with two cylindrical boilers, each twenty inches in diameter, embraced within that length, the whole weighing, inclusive of all the flues, three thousand pounds, two hundred gallons of water have been evaporated in an hour, under a pressure of ninety pounds to the square inch, and at the expense of two bushels of anthracite coal.

In order to facilitate the combustion, or rather the ignition of the coal, a slip chimney has been introduced into the engine, by means of which the height of the chimney may be varied at pleasure, from fourteen to twenty feet.

Among the advantages expected to result from this method of constructing boilers, are the exposure of a much larger comparative surface to the action of the heat; a very great reduction of the quantity, or weight, of the water necessary to a minimum supply in the boilers; a similar reduction in the weight of the boilers, as also in the thickness of the metal of which they are composed; together with certain facilities hereafter to be noticed, for removing, renewing, and replacing the boilers, without deranging other parts of the engine.

2nd. The steam is employed in the working cylinders in such a manner as will allow of its operating, not only by its absolute, but by its expansive force. This object is effected by means of certain adjustments in the steam valve apparatus, by the aid of which the entrance of the steam into each of the working cylinders, is interrupted, at about five eighths of the stroke of the piston. The advantages of such an arrangement are too obvious to require a particular designation. It is sufficient to remark, that by this means, three-fifths of the steam generated, are rendered quite as efficient as the whole would be without such an arrangement.

3d. The adoption of wooden wheels bound with wrought iron, and of such a construction as will admit of tightening the tire, or other-

wise repairing it, without materially affecting the relations between the centres and peripheries of the wheels.

It is obvious to any one acquainted with the nature of the materials employed in the construction of wheels, that the iron bands, or tires, of wooden wheels, will expand and contract by the ordinary changes in the temperature of any climate, in such a manner, and to such an extent, as will, sooner or later, render the tire loose upon the felloes. In the wheels of the Pennsylvania locomotive, such a defect is readily remedied by withdrawing the flange tire and inserting thin iron wedges between the remaining tire and the felloes, without the hazard of producing eccentricity in the wheel.

4th. The construction and application of boxes or bearings for the wheels, or between the carriage frame and the axles, which not only serve as *steps* for the bearing journals of the axles, but as receptacles for the grease, oil, or unguent, necessary for their lubrication. The boxes are of the best hard brass, and are, moreover, adjusted to *bosses* attached to the axle in such a manner as to obviate the use of linch-pins, or other apparatus, to confine the axles in their bearing.

5th. The construction of a carriage frame, in a manner to afford the requisite stiffness in the engine, without the necessity of firm and substantial attachments to the boiler, as a means of imparting this essential property to the engine.

It must be manifest to every one conversant with steam engines, that the ordinary or rather extraordinary strain produced in boilers by the expansive force of high steam, is all that they ought to be compelled to resist. If to this great strain, that attendant on the concussions of a heavy engine in rapid motion, be added, the liability to explosion is greatly increased, while at the same time, rents and fissures in the joinings of the boilers, of a character seriously to injure the engine, and impair its efficiency, are likely to occur.

The only remedy hitherto devised to correct this difficulty, has been found in increasing the thickness of the metal composing the boilers, which must of course add proportionately to the weight of the engine, without increasing its efficiency. The evil here adverted to, has been far more advantageously remedied in the Pennsylvania locomotive in the way just suggested, viz. by giving to the engine the requisite stiffness without depending on attachments to the boiler for the attainment of this object.

The boilers, instead of being firmly connected with the frame, are merely suspended within it by the introduction of springs, whereby they are exempt from the violent shocks to which other parts of the engine are occasionally exposed. By means of this arrangement, also, the working parts of the engine are relieved from the vibrations and other irregularities calculated to impair the efficiency, and injure those parts of the engine affected by such irregularities.

6th. Lightness in the construction of locomotive engines has been regarded as a leading object of this invention. This object, it is believed, has elicited far less attention from those concerned in railroads than it deserves, especially when viewed in connexion with rapid transportation. Strong objections have repeatedly been urged

against the employment of light engines, on the ground of their not having sufficient adhesion to the rails, to prevent the wheels from slipping. In reply to such objections, it is proper to observe, that it is very seldom that a gross load weighing more than thirty tons, including passengers, baggage, and cars, is ever offered for rapid conveyance, and that an engine weighing only three tons, has sufficient adhesion to convey such a load, even on a road slightly ascending.

In view of the solidity and texture of the materials of which engines must be composed, it is confidently believed that the greatest economical speed for an engine weighing six tons, will not exceed fifteen miles an hour. It is as confidently believed that a greater speed, with an engine of the weight just mentioned, would be attended with serious injury not only to the engine itself, but to the rails and other parts of the road on which it travels. This being admitted, the inference is fair and conclusive, being grounded on the laws of motion, concussion, &c. by which the movements of heavy bodies are governed, that an engine weighing three tons only, and moving at the rate of thirty miles per hour, will be attended with shocks equally severe, and, consequently, that the *wear and tear* of the engine, rails, &c. will be equal in both cases. Hence if a speed of thirty miles per hour must be attained, the weight of the engine ought not to exceed three tons. This may be regarded by some, as a mere matter of assumption, yet facts may be adduced, of a character to corroborate and enforce such a conclusion.

Having given the foregoing explanations touching the objects aimed at in the construction of the Pennsylvania locomotive, the writer will conclude his remarks for the present, by recording a few of the general results drawn from numerous and repeated trials of this engine, on the rail-road leading from Philadelphia to Germantown.

The extent of this road between the two places above mentioned, is six and a half miles. Its ascent from the depot, in Ninth street, to its termination in Germantown, is 207 feet, or a little more than thirty feet per mile. The steepest ascent, is at the rate of forty-five feet per mile, which occurs in a distance of about half a mile, in Germantown. The road is exceedingly crooked, and the evenness of its surface is much impaired by the settling of embankments, and the consequent derangement of the rail-tracks. The number of trips, outward and returning, performed by the engine, is about eighty, the whole of which were attended with similar results. In no instance has a trip been interrupted for want of sufficient steam; on the contrary, at almost every trip, the fire door has been thrown open a part of the time, in order to prevent the generation of more steam than could be used.

The only fuel employed was anthracite coal. The quantity consumed in running to Germantown and back again, did not exceed two bushels. The quantity of water evaporated under a pressure of eighty to ninety pounds per square inch, was about 200 gallons per trip. The engine has repeatedly started with a fresh charge of coal in the furnace, and with a pressure of steam barely sufficient to put the train in motion, yet, on reaching a distance of three or four miles,

on an ascending trip, while the train was moving at its greatest speed, the steam was generated in such profusion, as to force open both safety valves at once.

The results that will now be noticed, all of which relate to ascending or outward trips only, are as follows, viz.—

Three passenger cars, with fifty passengers, were drawn the entire distance in twenty-eight minutes, including two stoppages on account of way passengers.

Three passenger cars, with sixty-nine passengers, were drawn through the same distance in twenty-six minutes, including four stoppages as above.

Three passenger cars, with 124 passengers, were drawn, as above, in twenty-nine minutes, including three stoppages as before.

Two passenger cars were drawn, as above, in nineteen minutes, the number of passengers being forty.

To these may be added the two following trials, with burthen cars:—

A gross load of eleven and a half tons, was conveyed to Germantown, in twenty-six minutes.

Six burthen cars, each weighing 28¼ cwt., three of the cars being loaded with stones, gross load, by estimate, twenty-five tons, were conveyed upward on the steepest and most crooked part of the road, the ascent on a part of the distance being at the rate of forty-five feet per mile, at a speed, as nearly as the engineer could judge, of at least twelve miles per hour.

On the 4th of July, six trips were made, each with three cars attached. Average time of ascent twenty-five minutes; average number of passengers conveyed, between sixty and seventy.

By a fair comparison with the results of other engines plying on the same road, and propelled by the use of pine wood for fuel,—the cost of coal required to perform a given service, does not exceed one-half that of pine wood for a similar performance,—two bushels of the former being of equal efficiency with one-fourth of a cord of the latter.

There is still another consideration which entitles anthracite coal to a decided preference before pine wood, or any other fuel employed in locomotive engines, which is that, in the use of the former, passengers are entirely exempt from the annoyance of smoke, sparks, cinders, &c. which are produced and thrown out in great profusion when other kinds of fuel are employed.

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Girard College.

The corner stone of this institution was laid on the 4th of July last, and the labours preparatory to the erection of the superstructure are now going on. The subject of general education is one in which we take an intense interest, and we rejoice to witness the increasing the wide-spreading conviction of its importance, and its absolute necessity to the full development and the perpetuation of our

free institutions. The splendid bequest of the late Stephen Girard is an event characteristic of the spirit of the age, and we confidently hope that it will mark a most important era in the annals of education. We consider the notice of such an event as peculiarly appropriate to the pages of a journal devoted to the promotion of the useful arts, and the diffusion of general science, and shall therefore take other opportunities of adverting to it. Our design on the present occasion is merely to write a few lines prefatory to the admirable address of the Chairman of the Board of Trustees, delivered at the time of laying the corner stone of the intended edifice. It is our wish to give to this address a more permanent form that that which it would receive from its general publication in the daily journals. Its literary merits alone would fully justify this procedure, but apart from this consideration, there are many others which, in our opinion, urge its insertion; of these we will now mention only one, which is the view that it takes of the character of Stephen Girard. Believing, as we do, that this view is a perfectly correct one, and metes to him that perfect justice which some persons have manifested a disposition to withhold, we are desirous of aiding in the diffusion of a paper which we believe is destined to give a fixed tone to the public sentiment on this point.

EDITOR.

ADDRESS,

By NICHOLAS BIDDLE, ESQ.

Chairman of the Trustees of the Girard College for Orphans; pronounced by request of the Building committee, on the occasion of laying the corner-stone of the edifice, July 4th, 1833.

FELLOW CITIZENS,—We have now witnessed the laying of the corner stone of the Girard College for orphans. That stone, simple, massive, and enduring, the fit emblem of the structure to be reared from it, and of the man whose name it bears, has been deposited in its final resting place—the earth received it—to-morrow the earth will cover it. Ours are the last eyes which shall look upon it, and hereafter it will lie in its silent repose, unmoved by all the revolutions of the changing world above it.

And yet from out that depth is to rise the spirit which may more influence the destiny of ourselves and our children, than all else the world now contains. The seed that has been planted is of the tree of knowledge—that growth which gives to existence all that renders it attractive—flowers for our early youth—fruits in maturer life—and shelter for declining years. It is that knowledge which, trampling down in its progress the dominion of brutal force, and giving to intellect its just ascendency, has at length become the master power of the world. No people can now be distinguished or prosperous, or truly great, but by the diffusion of knowledge—and in the stirring competition of the roused spirits of our time, the first glory, and the highest success, must be assigned to the best educated nation. If this be true in our relations abroad, it is far more true at home. Our institutions have boldly ventured to place the whole

power of the country in the hands of the people at large, freed from all the great restraints which in other countries were deemed necessary. In doing this, their reliance is entirely on the general intelligence and education of the community, without which such institutions could have neither permanence nor value. Their brilliant success has hitherto justified that confidence, but as our population becomes concentrated into denser masses, with more excited passions and keener wants, the corrective influence of instruction becomes daily more essential. The education then of the people, which elsewhere is desirable or useful, becomes with us essential to the enjoyment as well as to the safety of our institutions. Our general equality of rights would be unavailing without the intelligence to understand and to defend them—our general equality of power would be dangerous if it enabled an ignorant mass to triumph by numerical force over the superior intelligence which it evinced—our universal right to political distinction, unless the people are qualified for it by education, becomes a mere abstraction, exciting only an abortive ambition. While, therefore, to be uneducated and ignorant, is in other countries a private misfortune, in ours it is a public wrong; and the great object to which statesmen should direct their efforts is to elevate the standard of public instruction to the level, the high table land, of our institutions. It is thus that this day has been appropriately chosen for the present solemnity.

It is fit that the anniversary of that day when our ancestors laid the broad foundations of our public liberties—on that day when our countrymen, throughout this prosperous empire, are enjoying the blessings which these institutions confer, we, in our sphere of duty, should commence this great work which is so eminently adapted to secure and perpetuate them.

Of this truth no man had a deeper conviction than our distinguished fellow citizen, whose history, and whose design in founding this institution, may aptly occupy for a few moments, our attention.

Of these, now that the tomb has dissipated all the illusions which once surrounded them, we can speak with the impartiality of history; and here on this chosen spot, the scene of his future fame, we may freely bestow on his memory, the homage which his unassuming nature would have shunned while living.

We all remember, and most of us knew him;—Plain in appearance, simple in manners, frugal in all his habits, his long life was one unbroken succession of intense and untiring industry; wealthy, yet without indulging in the ordinary luxuries which wealth may procure —a stranger to the social circle—indifferent to political distinction—with no apparent enjoyment except in impelling and regulating the multiplied occupations of which he was the centre,—whose very relaxation was only variety of labour,he passed from youth to manhood, and finally to extreme old age, the same unchanged, unvarying model of judicious and successful enterprise. At length, men began to gaze with wonder on this mysterious being, who, without any of the ordinary stimulants to exertion, urged by neither his own wants, nor the wants of others,—with riches already beyond the hopes of avarice,

yet persevered in this unceasing scheme of accumulation, and, possessing so much, strove to possess more as anxiously as if he possessed nothing. They did not know that under that cold exterior, and aloof in the stern solitude of his mind, with all that seeming indifference to the world and to the world's opinions, he yet felt the deepest sympathy for human affliction, and nursed a stronger, yet a far nobler and wiser ambition to benefit mankind, than ever animated the most devoted follower of that world's applause. His death first revealed that all this accumulation of his laborious and prolonged existence was to be the inheritance of us and of our children,—that for our and their comfort, the city of his adoption was to be improved and embellished, and above all, that for their advancement in science and in morals, were to be dedicated the fruits of his long years of toil.

It required the self-denial of no common mind, to resist the temptation of being himself the witness and the administrator of this bounty, and to have abstained from enjoying the applause of his grateful countrymen, who would have acknowledged with affectionate respect, the benefits which they derived from him. Yet even this secret and prospective munificence, must have had its charm for a mind like his, and we may well imagine that the deep and retired stillness of his spirit, was often soothed with the visions of the lasting good, and perhaps, too, of the posthumous glory, which he was preparing. Such contemplations he might well indulge, for to few have they been so fully realized. From the moment that foundation stone touched the earth, the name of Girard was beyond the reach of oblivion. From this hour, that name is destined to survive to the latest posterity, and while letters and the arts exist, he will be cited as the man who with a generous spirit and a sagacious foresight, bequeathed for the improvement of his fellow men, the accumulated earnings of his life. He will be remembered in all future times by the emphatic title with which he chooses to be designated, and with which he commences his will—a title by which we ourselves may proudly recognise him as "Stephen Girard, of the city of Philadelphia, and commonwealth of Pennsylvania, merchant and mariner"—the author of a more munificent act of enlightened charity than was ever performed by any other human being.

His will indeed be the most durable basis of all human distinction —a wise benevolence in the cause of letters. The ordinary charity which feeds or clothes the distressed, estimable as it is, relieves only the physical wants of the sufferer. But the enlightened beneficence which looks deeper into the wants of our nature—which not merely prolongs existence, but renders that existence a blessing, by pouring into these recesses of sorrow, the radiance of moral and intellectual cultivation—this it is which forms the world's truest benefactor, and confers the most enduring of all fame. His glory is the more secure, because the very objects of that benevolence are enabled to repay with fame, the kindness which sustains them.

It is not unreasonable to conjecture that in all future times, there will probably be in existence many thousand men who will owe to

Girard the greatest of all blessings, a virtuous education; men who will have been rescued from want, and perhaps from vice, and armed with power to rise to wealth and distinction. Among them will be found some of the best educated citizens, accomplished scholars, intelligent mechanics, distinguished artists, and the most prominent statesmen. In the midst of their prosperity, such men can never forget the source of it, nor will they ever cease to mingle with their prayers, and to commemorate with their labours, the name of their great benefactor. What human being can be insensible to the happiness of having caused such a succession of good through remote ages, or not feel that such applause is more grateful than all the shouts which ever rose from the bloodiest field of battle, and worth all the vulgar fame of a hundred conquests. Our estimate of its value will be increased by considering the nature and design of this institution.

After the buildings shall have been completed, there will remain for their support the annual income from two millions of dollars, now yielding $102,000, and if these funds should be inadequate for all the orphans applying for admission, the income of nearly all the remainder of the estate is to be appropriated to the erection of as many new buildings as his square in the city would have contained. So that, in general, it may be stated with reasonable confidence, that when all the buildings are ready for the reception of the pupils, there will be available for the maintenance of the institution, an income of not less than one hundred thousand dollars, which may be increased to at least two hundred and twenty thousand dollars.

These ample funds are to be devoted to the maintenance and education of "poor male white orphan children." Of all the classes of human indigence there are none more helpless, and none more entitled to our sympathies, than these children of misfortune. They have lost their natural protectors. The arms which have hitherto embraced and sustained them, have been folded in death. They began life in comfort, perhaps in affluence, but now they stand alone, abandoned and helpless, to struggle against the world's coldness, with precarious means of subsistence, with no means of instruction, and treading on that narrow and slippery verge which too often alone separates want from crime. From this friendless condition they are rescued by the benevolence of Girard, who not merely provides the means of subsistence, but redressing the wrongs of fortune, raises them at once in the scale of beings, and qualifies them at once to be useful members of that society which they would otherwise disturb, or corrupt.

How wide the limits of that benevolence may be, it is impossible to conjecture. If the imperfection of language suggests a doubt as to the degree of destitution which makes "an orphan," the greater weakness of our nature forces upon us the melancholy inquiry—what child is there who may not be a poor orphan? Who is there indeed among us whose children may not yet need the blessings of this institution? Let none of us, in the confidence of prosperity, deem his own offspring secure. Alas! all our prosperity is so vain and shadowy, and misfortune is so constantly in ambush to assail us, that it were presumptuous in any of us to suppose himself beyond the reach

of vicissitudes, which would render such an institution the happiest refuge for his children. Yes, fellow citizens, this college is our own, the property of us all. It is intended to remedy misfortunes to which we are all equally liable. And it should be a source of great consolation to each of us, that if, in the ever varying turns of human life, misfortune should overtake, and death surprise us, they who bear our names, and are destined to be the fathers of our descendents, will here find a home where they may be prepared for future usefulness, and become in turn the protectors and support of their more helpless relatives.

Hereafter, thanks to the bounty of Girard, every father among us may, on his death bed, enjoy the reflection, that although unprovided with fortune, there is secured to his sons that which is at once the means of fortune, and far better than the amplest fortune without it, a good education. This consideration, if any such incentive were wanting, may serve to stimulate the sense of public duty in those who administer the institution, to render it worthy of their own children.

For this purpose, happily, it is only necessary to fulfil the design of the founder, which provides ample means and expressly enjoins the employment of them, to give every kind of liberal and useful instruction.

[TO BE CONTINUED.]

Observations on some points relating to the Construction of Rail-roads.

By the EDITOR.

The number of rail-roads which are being constructed, and the still greater number which it is proposed to construct in our country, render it specially important that all the information which our short acquaintance with this mode of conveyance has afforded, should be as extensively diffused as possible. The question of the utility of rail-roads for the general conveyance of merchandise and of passengers, may now be considered as settled; but we have much to learn as respects the best mode of constructing them so as to insure their durability, whilst the necessary attention is paid to economy in the first instance. There are but few situations in which rail-roads can be carried to any great extent, without a very large outlay for grading, and for building bridges and culverts; their utility is necessarily so dependent upon their near approach to a level, that but little diminution of their cost is to be anticipated so far as these points are concerned. Not so, however, as regards the kind of rails which it is best to employ, the sort of foundation upon which they should be laid, and the best mode of fastening them so as to insure their permanence. The present notice will be principally confined to one or two points connected with this latter part of the subject.

On the Baltimore and Ohio rail-road, the plate rail has been exclusively used, and the same has been most generally adopted in other places. These iron plates, which are usually about two inches and a

quarter wide, and five-eighths thick, were at first laid upon rails of wood, to which they were securely fastened by nails; it was generally believed, however, that a foundation consisting of sills of granite, or other hard stone, in place of the wooden rail, would, by its permanence, more than repay the extra cost of it in all situations where it could be readily procured; on the road first named it was therefore adopted, after carrying the wooden rails to the quarries where such stone could be obtained. It is believed that not the slightest doubt existed on the minds either of the engineers or the directors, of the superior utility of stone in every respect; and, in conformity with this opinion, many miles have been laid with it, and the iron rails carefully secured thereto. In riding over this road, the moment of passing from the wooden to the stone rails can be at once both heard and felt by the passengers in the car. Upon the wood the sound is less harsh, and the vibration less rapid than upon the unyielding stone, the elasticity of the wooden rail rendering it the most pleasant to ride upon; a mere difference of this kind, however, was not to be considered as presenting any valid objection to the use of a material so permanent as the stone. On a recent visit to Baltimore, where we had an opportunity of conversing with individuals whose talents and interest in the road give value to their opinions, we learned with much regret that the result of the experience which they have had, has led them to a conviction that the stone sills must be abandoned, and string pieces of wood resorted to throughout the route, in consequence of the gradual, but inevitable loosening of the iron rails. This has not arisen from any defect in the method by which the rails were secured to the stone, but from causes which cannot be obviated by any skill or care on the part of the workmen, as it is the result, principally, of the vibration produced by the passage of locomotives and cars upon the rails. However carefully such rails may be laid, the points of contact between them and the stones will be but few, and as these are abraded by the vibration, the rails will have a small degree of play; this evil will necessarily go on increasing, and the heads of the nails will eventually be worn off by it, as has actually happened.

It has been proposed to obviate the foregoing defect by interposing a thin strip of wood, or other yielding material, between the iron rail and the stone; this would no doubt lessen it, but to what extent, must be left to the result of experiment. The loosening of the rail upon the stone is, no doubt, in part due to the expansion and contraction of the former, whilst upon a wooden rail but little sensible effect is produced from this cause, the yielding nature of this material serving to prevent it; the degree in which this expansion and contraction operate in loosening the rail would, however, be but slightly diminished by a thin strip of wood, although it appears to be calculated to remove much of the greater evil, the abrasion.

The portions of a rail-road which pass over the original surface of the soil, are very small; excavation or embankment, to a greater or lesser extent, is necessary almost every where. The laying of stone sills on these embankments, when recently made, has been another source of much difficulty in the construction of rail-roads, as in such

places the earth must necessarily continue to settle for a considerable period of time, not only displacing the sills at their junctures, but likewise affecting the grading, and all the calculations founded thereon. It may not excite surprise that the loosening of the rails upon the stone sills was not foreseen in all its extent; but it is certainly remarkable that the capital error of using stone sills on new made ground, should have been any where committed; yet such has been the case to a considerable extent. To raise these sunken sills, with the rails upon them, is a work of great labour, and one, which in high embankments, it may be necessary to repeat several times. This settling of the earth must take place, whatever be the kind of rail used, but the derangement is much less when the plates are laid on wooden string pieces, and the labour of readjustment may be performed with much greater ease.

We have recently travelled along the rail-road leading from Philadelphia to Germantown, and also on the Pennsylvania rail-road, now in the course of construction between Philadelphia and Columbia on the Susquehanna. On the whole of the former, and on a large portion of the latter, the rolled iron edge rail has been adopted. The general plan of forming the foundation of these rails is to sink stone blocks, (each containing about two cubic feet,) at the distance of about three feet from each other, and upon these blocks to fasten cast iron chairs, which receive the lower edges of the rails, and into which they are fastened by suitable wedges. The want of stability in these blocks is already manifest in both these roads, although they are not yet completed, and upon one of them, the Pennsylvania road, locomotive engines have not yet run. The blocks have in some places sunk so as to render the line of the rail undulating to such an extent as to be visible while passing along it. The same circumstances which produce the sinking of the stone sills must operate with equal or greater force in the case of the blocks and chairs. In some places also the rails have been pressed out, and in one instance, at least, on the Germantown road, the rails were so far separated as to allow the wheels of the locomotive engine to fall between them. The numerous curves on these roads render the rails much more liable to be pressed out than those on straighter roads, as the flanches of the wheels, when the engines and cars are moving at high velocities, bear with a force which is with difficulty resisted against the outer rail of the curve, and especially at the moment of changing from one curve to another, or from a straight track to a curve.

There is an old saying that "once well done, is twice done," and although it is much more easy to point out defects than it is to prescribe adequate remedies, it is a thing of high importance in extensive and costly public works that they should not be disgraced by imperfections in the mode of executing them. Although the comparative novelty of rail-roads as a medium of general intercourse and trade, forbids the supposition that we have yet acquired a knowledge of the best mode of constructing them, this will not serve as an apology for a perseverance in known and manifest error. The abandonment

of three-fourths of the rail-roads which have been projected will not be attended by any actual loss, whilst their imperfect construction will not only disappoint the public expectation, but discourage future undertakings of the kind. The first failure may be the result of inexperience, and be, therefore, altogether pardonable, but when the evil and its cause are evident, the course of procedure ought to be changed, in spite of the prejudices of workmen, or the interest of contractors.

The remedies to be applied to obviate or to lessen the defects which have been referred to must necessarily depend upon the means under the control of the engineer, and will therefore differ in different places. Along a large portion of the line of the Pennsylvania rail-road, locust timber may be readily obtained, and where the embankments are not very high, blocks of this wood might rest upon broken stone on the original surface of the ground, and extend up to the level of the road; and these posts might, when necessary, have ties from one to another across the track, to prevent their spreading. This timber is the most durable known, and the chairs would be readily affixed to it. Long blocks of stone, like the sills upon which rails have been laid, extending across from one rail to the other, and receiving the chairs for the edge rail, would completely prevent their spreading. This expedient has been resorted to in some places on the Germantown road, the long stones having been used at the joints of the rails, and stone blocks in the intermediate parts.

These remarks are intended as mere hints which may in some cases be made useful, or serve as inducements to the competent engineer, to devise better modes of procedure. The mentioning of a *competent engineer*, reminds us of one other point essentially connected with the subject in hand, a remark respecting which shall close the present article. We have some gentlemen in our country to whom the foregoing title may be justly applied, but numbers are so dubbed, who have not the slightest claim to the appellation, and, in not a few instances, the direction of important works has been entrusted to such men because they might be *got cheap*. Real talent in this line is never too highly paid for; but a Board of directors will not unfrequently sacrifice hundreds of thousands, to save a thousand or two of dollars in an annual salary.

The foregoing remarks have been elicited by what we have recently seen and heard, and are committed to paper during the continuance of the tour in which they have been suggested.

FRANKLIN INSTITUTE.

Minutes of the Quarterly Meeting.

The thirty-eighth quarterly meeting of the Institute was held at their Hall, July 18, 1838.

Thomas Fletcher, Vice President, in the chair.

William Hamilton, was appointed Recording Secretary, P. T.

The minutes of the last quarterly meeting were read and approved.

Donations of books were received from Messrs. S. C. Atkinson, R. S. Gilbert, Robert Smith, Col. A. Langworthy, Col. J. G. Watmough, and Petty Vaughan, Esq. of London:

Various specimens of iron ore from Mr. John Wiegand:

A brass model of a screw press from Mr. Adam Ramage:

A specimen of steel made from American iron, on the Brandywine, by P. A. Karthhause, Esq. of Baltimore.

The corresponding secretary laid on the table the various journals which had been received during the last three months, in exchange for the Journal of the Institute.

The chairman of the Board of Managers read the thirty-eighth quarterly report of the Board, which was accepted; and, on motion, referred to the committee on publications, with instructions to publish such parts as they may deem expedient.

The treasurer's report for the quarter ending July 1, 1833, was read and accepted.

Extract from minutes.

THOMAS FLETCHER, Vice President.

WILLIAM HAMILTON, Rec. Sec. P. T.

Quarterly Report of the Board of Managers.

In compliance with the requisitions of the constitution, the Board of Managers of the Institute submit their report for the past quarter. Although the quarter has been one of those in which the active operations in the interesting branch of instruction are suspended, it has not been devoid of interest. The preparations for the exhibition of domestic manufactures, to be held in the autumn, the experiment of monthly conversation meetings, which has been in progress, the reference of the subject of weights and measures to the Institute, and the transfer of the collections of the Maclurean Lyceum to this society, have added variety to the usual duties and business of the institution.

The committee on premiums and exhibitions hold stated meetings with the committee of arrangement, to mature and execute their plans for the distribution of information to manufacturers and mechanics, in relation to the objects of industry to be exhibited in the coming autumn. By the liberality of the New Castle and Frenchtown Rail-road Company, that committee have been enabled to offer a premium for a successful method of preventing the escape of sparks from the flues of locomotive carriages, in which wood is used as fuel. The company have furnished a brief statement of the plans which had been tried before the offer of the premium, which statement has been communicated to those applying for information to the Institute.

The experiment of monthly conversation meetings, made by direction of the annual meeting of the Institute, has been highly successful. As was anticipated, the absence of formality in these meetings

has induced many to contribute to the information of their fellow members who otherwise would hardly have come forward, and where no special and avowed communication has been made, interesting remarks and discussions have been engaged in by many who came as listeners only. The months of July and August would be unfavourable to the assemblage, in comfort, of so many persons as frequent these meetings, and the Board respectfully recommend their omission during these two months.

By a resolution of the House of Representatives of this state, the Secretary of the Commonwealth was directed to refer to the Managers of the Institute, the bill relating to "weights and measures, and to admeasurement," with a request that report should be made, in relation to it, at the next session of the legislature. This bill, with the resolution of reference, &c. was received at the meeting of the managers in June last, and referred to a committee of nineteen to report to the Board. The names of the committee are appended to this report.

The committee on instruction have already commenced a revision of the arrangements of last year, in regard to the several branches thereof. The drawing school has received particular attention, and will, it is hoped, be materially improved in its organization. The committee have made arrangements to obtain from the professors, and to furnish to the class, a programme, or outline, of each of the regular courses of lectures.

The managers have made, during the last quarter, an arrangement by which the collections in natural history, books, and other property, of the Maclurean Lyceum of this city, have been transferred to the Institute, the members of the Lyceum becoming life members of this association. The entire right of disposal of this property has been vested in the Institute, and a committee has been appointed to effect the transfer of the articles to our Hall. In process of time, it is hoped to exchange such of these articles, as do not come within the scope of our society, for others more directly interesting to us, retaining such as will add materially to the interest of our collection of minerals and geological specimens.

The eleventh volume of the Journal of the Institute has been completed by the appearance of the June number. This journal, from the amount and interest of the original matter which it contains, furnished in relation to the patents by the editor, and in the miscellaneous matters by occasional correspondents, may, it is believed, stand an advantageous comparison with scientific journals at home, and with those in the same walks abroad. The circulation of this periodical should be anxiously promoted by every member of the Institute: they would thereby aid in diffusing through its means useful information in relation to the mechanic arts, and in general science, and look to an increase of subscribers to produce a diminution in the present price of subscription; in this point of view, each subscriber is interested in increasing its circulation.

The account of the treasurer is herewith submitted.

During the past six months the following persons have become life members of the Institute:—

R. La Roche, M. D.
Charles Robb
David Winebrener
Henry Paul Beck
R. F. Allen
Isaac Ashmead
Jacob Gilliams
John T Sharpless, M. D.
Frederick Fraley
J. A. C. Trautwine
S. G. Sheppard
Joseph Wood
C. B. Matthews, M. D.
B. M. Hollinshead
George L. Johnson
John Hewitt
Saml. Freedly, M. D.
Henry Lehr
Thos. Wardle
Wm. Foster
Wm. Kester.

Committee on Weights and Measures.

A. D. Bache
S. V. Merrick
W. H. Keating
Rufus Tyler
M. W. Baldwin
Benjamin Say
Asa Spencer
Abrm. Miller
Thos. P. Jones, M. D.
R. M. Patterson, M. D.
Sears C. Walker
Benj. Stancliffe
Thos. M'Euen, M. D.
Edmund Draper
David H. Mason
Benj. Reeves
Frederick Fraley
Samuel Moore
Samuel Hains.

A. D. Bache, *Chairman.*

William Hamilton, *Actuary.*

BIBLIOGRAPHICAL NOTICE.

Letters to a German Princess, on different subjects of Natural Philosophy. By Leonard Euler.—Harpers, New York.

We know not in what form these letters appeared in England, but certain we are that in their present form, as designed for popular instruction, a selection from them would have furnished one volume of a much more useful character than the present two. The acoustics and much of the optics, might have been advantageously preserved, and, in particular, the whole of the admirable little chapters on the means of determining the latitude and longitude,—which are indeed models of popular scientific writing,—while the greater part of the rest might with great propriety have been omitted. The magnetism, electricity, &c. of Euler's day, and particularly of a man who was so much given to speculation, as he was, is necessarily behind the age, to a degree not to be at all remedied by the occasional comments of an editor. We shall not indulge, after what we have said in any detail of criticism, but shall conclude our remarks upon this part of the subject by a few obvious comments upon what Euler considers an insurmountable objection to the theory of vision by reflexion, or that non luminous bodies are rendered visible by means of the light which

falls from them being in part reflected or thrown back from their surfaces. The objection to this view upon which he lays the greatest stress, is, that when reflexion does fairly take place, we see not the reflecting body itself, but the image of another which is the object reflected. Thus in looking into a mirror, we see not the mirror itself, as much as ourselves. And, moreover, it is urged that the reflexion proceeds according to a well established physical law, that the angle of reflexion is always equal to the angle of incidence, whereas we see non-luminous bodies at all positions of the eye, the object, and the incident light.

Now any one who has witnessed the operation of *polishing*, has seen enough to deprive this objection of its force. Where there is a number of small reflecting planes placed at different angles with each other, as in the natural surfaces of most unpolished bodies, although each ray of light that is reflected follows the law, it is manifestly impossible that an assemblage of such rays, constituting a beam,—the different rays falling upon different planes,—should be reflected in the same way as if they fell upon one continued superficies, as in the case of mirrors. In other words, there can be no *regular* reflexion; but irregular reflexion, or reflexion from variously inclined planes must ensue, the obvious effect of which is to prevent, by the scattering, the formation of any *image* by reflexion. The operation of polishing consists in reducing, as far as possible, this assemblage of small planes to one continued superficies; and in proportion as this is effected, regular reflexion takes place. Thus much as to our seeing, or not, according to circumstances, a reflected image. As to the other part of the objection, viz. that we see the reflecting body itself, it is to be observed that the only sensation by which we are rendered sensible of the sight of a body is a difference between the light coming from it, and that which proceeds from other bodies, whether a difference in intensity, or colour, &c. Now, since in the case of reflexion, there is always a diminution of intensity, different for different bodies, and always some, and generally a great, difference in the colour, and varying greatly for different bodies, we have an obvious solution of this part of the question.

It is, moreover, to be observed, that the light reflected on the incidence of white light is never homogeneous or pure, and consequently that the colour is not simple; and in like manner in the blackest bodies there is never a total absence of reflected light. Thus coal, the blackest body in nature, reflects a portion of white light. We have made this remark that we might more conveniently refer to a familiar example that affords a clear illustration of the above observations: we mean the ordinary operation of blacking a shoe. When the blacking is first put on, by far the greater proportion of the incident light is absorbed, and what is reflected is scattered by irregular reflexion. When the shoe comes to be rubbed with the brush, the gradual reduction of the various planes to a common superficies is shown in the regularity of the reflexion of the white light which had previously been scattered; (the total amount of this reflected light may also perhaps be increased by the alteration in the mechanical configuration of

the surface,) in a word, it *shines*, and this is doubtless the true theory of a *shining black*.

Euler was emphatically a mathematical genius. Here he laid the foundations of his fame, deep and wide. He has, moreover, the singular merit of having adopted and illustrated a theory of light, the undulatory, which has since afforded so beautiful an explanation of some of the most surprising phenomena of optics. He appears to have possessed that enthusiasm in a favourite pursuit which is the immediate characteristic of genius. He is said to have lost his eyesight in consequence of a fever brought on by his intense application during a period of three days to the solution of a mathematical problem. He left materials sufficient to comply with the request of a friend, that he would leave enough behind him to furnish annual memoirs on different mathematical subjects, for twenty years after his death; an injudicious request, however, for both his friend and himself seem to have forgotten the necessary march of science. Even in so short a time, much of that which at a previous period would have been so acceptable to the inquiring spirit of the times, has become, like parts of the present work, "behind the age." W.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

Letters upon Natural History, Geology, Chemistry, the Application of Steam, and interesting Discoveries in the Arts. By TIMOTHY FLINT. Lilly, Wait, Coleman, and Holden, Boston.

MR. EDITOR,—I had prepared some remarks upon the work of which the title is given above, with the design of submitting them to you for insertion in your Journal, when I found I had been in part anticipated by an article in your last number; if, however, you should think the thing worthy of further notice, my lucubrations, in a modified form, are still at your service.

The author of these lectures had become favourably known to the literary world by the information which he had given respecting the valley of the Mississippi, as well as on some other subjects, and it is to be regretted that he should have risked the portion of fame which he had acquired by the attempt to give instruction upon subjects of which he is grossly ignorant. When a man of learning can step down from the elevation which he may have attained, and furnish a lucid explanation of the principles upon which his science is founded so as to direct the first steps of the inquirer after knowledge, his conduct is worthy of all praise, as he becomes one of the best benefactors of his race. This, during the last half century, has been so frequently done, as to have afforded facilities in the business of education of which our forefathers had not the most remote conception. Whilst this has been accomplished, however, the world has been inundated by the trash which has flowed from the finger ends of those who have been "wiser in their own conceit than seven men who could render a reason," and it has become the occurrence of every day that some individual who has

got his name up by writing upon a subject of which he has happened to know something, undertakes to instruct the world upon various, or upon all, others. Many school-book makers might be brought forward in illustration of our position, but the fact is known to all.

Mr. Flint in the preface to the work before us professes to give "a condensed view of the prevalent systems and leading facts in science," and he has executed the task much as it might have been executed by an antediluvian; with this difference, however, that he has employed some terms which are believed to be of modern invention, and which, therefore, were scarcely known to Methusalah, or the other sages of that period, although they had about as correct an idea of the things signified by them as the author of the "Lectures."

The present notice must necessarily be confined to a few only of the errors in philosophy contained in the work of Mr. Flint; I have marked about two hundred of these on the margin of his book, although I have used my pencil on this occasion with a very sparing hand. The author, it appears, has followed, as a text book, "a French work, 'Lettres à Sophie,' by Aimē Martin," having, he says, rather paraphrased than translated it. I have not seen the original work, but were I to form an estimate of it in the guise which it has now assumed, I should be compelled to conclude, that it is written in that inflated style which is by no means uncommon among the minor French authors; if this judgment be incorrect, Mr. Amiē may perhaps discover to whom he is indebted for the injustice of it. With a few exceptions, the style of the lectures is bad; and, as a work intended for instruction, it must be considered as altogether worthless, even were its "facts" correctly stated; because, leaping over all first principles, it pretends to explain things which it is impossible to understand without them. How correctly, or rather how incorrectly, the facts and doctrines of the physical sciences have been treated, has been made apparent to some extent by the reviewer in your last number, and I shall merely make a few additions to the black list.

P. 18. "There are bodies which are not seen except in the form of solids, as the infusible metals, and the simple earths." Infusible metals do not exist, and most of the *simple* earths are known to be *compounds*, while all of them are believed so to be.

Ib. "The aggregation of bodies is chiefly effected by heat and chemical combination." What is here meant it is difficult to tell. I have been taught, however, that "the infusible metals and the simple earths" are aggregates; will Mr. Flint tell us how their aggregation is effected by heat?

Ib. "When the attractive force exceeds the repulsive, the body is solid; when both are in equilibrium, liquid." Why then do not the drops of rain fall into powder? Philosophers tell us, that is all philosophers with the exception of Mr. F., that the cohesive attraction exists in fluids; our senses confirm the information, and the book before us says that "two drops of water will run together."—p. 19. "The mixture of two substances results from a mutual attraction." Throughout the work, mixtures and chemical combinations are con-

founded together, and we are told that mixture takes place in consequence of "affinity."

P. 20. "The gravity of attraction." I have heard of the attraction of gravitation, and have attached some definite idea to the term, but the gravity of attraction is a complete novelty.

P. 21. "The attraction existing between homogeneous bodies is called *affinity.*" Is it indeed? Do, I pray you, sir, give your authority, as this is the first time I have heard it so called.

P. 22. "When a force draws a body *towards* a centre, while the body has received from another force an impulse *from* the centre, the motion produced is called *central motion.*" Should one of Mr. Flint's friends draw him towards the centre of a room, and another impel him with equal force in the reverse direction, that is, "from the centre," what will be his "*central motion?*"

P. 25. "Of opaque bodies whose surfaces are not polished, some send off nearly all the light they receive. These are white." Are not polished silver, statuary marble, and a hundred other *polished* articles, white? from the foregoing extract we must infer that they are not.

Ib. "Plane mirrors reflect the objects that fall upon them." Those that are not plane do something else, I suppose; we, however are not told what.

Ib. "Glass mirrors are the well known instruments employed for the common purposes of vision." The eyes of the author are employed for the common purposes of vision, *ergo*, they are glass mirrors.

P. 27. "In the camera obscura the images of distant objects are formed by a converging glass thrown upon some surface." Care must be, of course, taken upon what surface you throw your converging glass, or there may be some risk of breaking it.

Ib. "This is a most important instrument for a landscape painter, as the landscapes are represented with great beauty, and in perfect accuracy of proportion." Will Mr. F. put our camera obscura into order, for instead of "perfect accuracy of proportion," it bends all the styles of our square sash into curves, and renders all the angles spherical.

Dr. Wollaston's camera lucida is described on the same page with the foregoing, but the Doctor, were he alive, would not claim the bantling. Mr. F. says that it "consists of a quadrangular base, before which is placed a convex lens of considerable extent. Behind this in the base is a plane mirror placed at an angle of 45°, which reflects towards the cover the images of distant objects." Any passage taken at random from "Jack the Giant Killer," or any other literary work, would afford as clear and correct an idea of the instrument in question as does that above given; I have examined the camera lucida, of Wollaston but have never found the plane mirror, or the cover; and the same is the case with some of the other parts mentioned.

The lecture on affinity extends through six pages only, but the author has contrived to crowd into these more blunders and absurdities

than I have ever before seen in ten times the space; in this he has been singularly successful, as there is, in fact, scarcely a single truth, clearly expressed, contained in the whole of it.

P. 57. "The metals which are found in the bosom of the earth, owe their form and specific properties to affinity."

P. 58. "To this mysterious principle of nature we are indebted for the regularity of forms and qualities in organized and animal life."

Ib. "This affinity aggregates round the central nucleus of the seminal germ, be it the minutest molecule, a progressive pattern of the architype."

Ib. "Without this principle, the basis of order and classification in science would be destroyed, and the universe would be full of monsters before nature turned to chaos."

Ib. "This is clearly the cause of the phenomena of crystallization."

Ib. "They [the acids] are decomposed by combustible substances, and with metals form oxides."

P. 60. "The acids are the simplest among saline substances."

Ib. "Alkalies are saline substances, which have a sharp mordant taste; which, when concentrated, attract the humidity of the air." "Corrode and oxydate the metals, forming peculiar salts."

P. 61. "The fulminating powders * * * in the form of prussic or hydrocyanic acid has produced the most deadly poison yet known."

P. 62. "Both principles [affinity and caloric] appear to proceed from the same body, the sun."

Ib. "Increase the heat to another point, the molecules [of water] separate still further and become an elastic vapour. A little further rarified it becomes invisible vapour."

I have collected together the foregoing examples of the kind of information given in this lecture, in every one of which the chemist will meet with information not contained in any other work upon the subject. Were I to proceed with the marked passages, throughout the work, I should fill your seventy-two pages, and perhaps do something more than tire your readers; I shall, therefore, as I turn over the remaining three hundred and thirty leaves of Mr. Flint's Lectures, do no more than occasionally cull a nondescript, or pause to admire the lusus naturae, not a few of which are to be found there.

From a teacher of religion and philosophy we should not expect to meet with the remark, p. 73, that "The animals of prey, on the contrary, rarely banquet on their bloody feasts, but spend their time in guilty terror and apprehension, crouching in ambush for carnage." The propensities of the lion, the tiger, and the eagle, are as holy as those of the horse or the sheep; or of that animal even whose appetite is pampered by the sacrifice of the lives of so many of the creatures which browse on the earth, dart through the waters, or glide in the atmosphere, and who contrives instruments of various kinds to destroy them, for the supply of his wants, or to complete the catalogue of his

luxuries. Although the pious Watts has taught our children that hawks and kites are "unlucky birds of hateful name," this language would scarcely have been used by him had he lived in our day. He who created these animals gave to them their propensities, and pronounced them good.

P. 150. "Cause water to fall in mist between your eye and the sun, and you can make rainbows for yourself." In Newton's day it was necessary, in this case, to turn the back upon the sun, and to stand between that luminary and the spray.

Mr. Flint does not seem to know that steam is invisible, for whenever he speaks of it he treats it as a substance which can be distinctly seen. Of this I have already given one example, to which I add the following. At p. 184 he says "caloric entering into the particles of water dilates them first into steam, and then into invisible vapour." P. 305. "Carrying off a portion of the water in a visible form; this is called steam." *Ib.* "In the form of a visible elastic fluid will unite with the atmosphere."

To secure ourselves from lightning we have the following admirable recipe, p. 191. "It is only requisite to sit in a chair with glass feet, to cover the head with a silk veil, and to abstract from the person all ornaments of gold, silver, steel, or other metals." This would be about as effectual as a covering of tissue paper to protect a soldier against grape shot.

Respecting volcanoes and meteoric stones, we are presented with the following ridiculous stuff, together with much more of the like character. P. 209. "Different gases, according to M. Patrin, inflamed by the electric fluid, form the lava and other matters which the volcanoes emit." "Their fuel are the gases of which water is composed; that is to say, water and salt." "The stony matters are instantaneously formed by the contact of air, like a certain gas which changes instantly to quartz by the contact of water." "The basin of the Mediterranean would long since have been filled with a solid mass of salt if the volcanoes of the two Sicilies had not been placed in the midst of it, as prodigious laboratories to operate the decomposition of it. Admit this theory, and there is nothing strange or mysterious in the formation of meteoric stones in the atmosphere."

If your readers desire more of this kind of philosophy, they had better buy Mr. Flint's book, as in no other can they gratify their taste to so full an extent. The fifty-seventh lecture is "on the proper selection of books, and in this, if any where, is to be found the key to the present work. Speaking of the physical and exact sciences the author says, p. 389, "But I do not find these vehement partizans of the knowledge of facts and the exact sciences to be sensible and interesting companions." Mr. Flint has certainly determined, at all events, to be sensible and interesting in the highest degree.

A. B. C.

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED IN MARCH, 1833.

With Remarks and Exemplifications, by the Editor.

1. For a machine for *Thrashing Grain, and Hulling Clover Seed;* Stacy West, Hartford county, Maryland, March 1.

In this machine there are to be three cylinders, each about eight inches in diameter, and covered with plates of rolled, or of cast iron, having narrow flutes, or ridges, over their surfaces. The rollers are to be placed nearly in contact with each other, so that lines joining their gudgeons would form an equilateral triangle. They are so geared as to move with very different velocities, thus producing a rubbing effect on any article passed between them. The grain to be thrashed is placed upon a feeding table, and passed between the rollers. There are sliding boxes and wedges to regulate the distances of the rollers. When used for hulling clover seed, an endless apron, and some other appendages are added, to adapt it to that purpose.

The claim is to the machine "taken together as a whole; but particularly the arrangement, and unequal motion of the cylinders, when thrashing grain, or rubbing out clover seed."

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2. For a process by which *Lard or Tallow is converted into two separate substances;* Hamilton Lapham, Lexington, Fayettee county, Kentucky, March 1.

This is a patent for separating from each other the stearine and elaine, or the hard and soft materials of which fat in general is composed. The chemist is well aware that this process has been carried to a considerable extent in France, and a patent has been obtained in this country also, by Messrs. Seybert and Vaneuxem, for accomplishing the same purpose, but by an improved process. The specification of which patent was published by us. We believe, however, that the alkali, or alkaline earth, employed in the French and American processes, has not been so completely separated from the stearine, as to leave it in a good state for combustion. The article, however, is much more beautiful than spermaceti, having a crystalline texture, and a pearl-like gloss of peculiar splendour.

The present patentee states that one of the substances which he obtains from lard, &c. is to be used as a substitute for spermaceti oil, and that the other is to be manufactured into candles.

The lard, or tallow, according to the present process, is to be put into a kettle with about one-third of its volume of water, and then heated until the water boils; during the process of melting, the whole is to be frequently stirred, so as to mingle the two fluids intimately together. As soon, however, as the boiling commences, and the scum rises, the stirring is to be discontinued. The boiling should be moderate, and the impurities be skimmed off as long as they continue to rise; eventually, clots will appear, instead of scum, when the fire is to be withdrawn, and the mass allowed to cool, until the clots sub-

side, and the fluid appears limpid; it is then to be removed into a proper vessel, and thoroughly cooled.

The next step of the process consists in putting the material into strong leathern bags, which are to be further surrounded by hair cloth, or other strong envelope. Several of these bags, with a flat plate of iron, or piece of plank, between them, are to be subjected to strong pressure until the fluid matter ceases to run out, and this is then ready for use.

The solid matter is to be again boiled with about one-fourth of its bulk of weak ley, the proper strength of which will be readily ascertained by experience; it is then ready to be manufactured into candles.

The claim is to "the conversion of lard, or tallow, into a substitute for sperm oil, and a superior article for candles, by the process above described."

In the processes heretofore essayed, the great difficulty has arisen from the using an alkali with the hard material, as it combines with it, forming a species of soap, and injures its combustibility; and such, we apprehend, will be the effect of boiling with a weak ley, in the last part of the above described process.

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3. For an improvement in the mode of *Manufacturing Wood Screws.* First patented April 1, 1831. Patent surrendered, cancelled, and reissued on an amended specification, to Hazard Knowles, Colchester, New London county, Connecticut, March 1.

(See specification)

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4. For apparatus for *Manufacturing Ship Thimbles;* Barnabus Thatcher, Yarmouth, Barnstable county, Massachusetts, March 2.

The first part of the apparatus is a pair of tongs, made like smiths' tongs, so formed that when shut the jaws will form a perfect circle, equal in diameter to the outer diameter of the thimble. A concave swedge, of the proper size and form, is fitted to the hole in an anvil. The ring, heated, and held in the tongs, is then to be struck by a concave tool, properly formed, by which means the thimble will be completed. It is said that a screw, or other press, with suitable dies, may be substituted for the tools above described.

There is no particular claim made, the process being considered as altogether new in its application. We do not know that this is not the case, although it is not improbable that a mode of operating so common in the making of thousands of articles, such as the swedge, or bed, and punch, has been adopted, if not here, in some of the European navy yards, in the manufacture of ship thimbles. If this has not been the case it is well for the patentee, as we are informed that the thimbles made by his process are not only more rapidly but much more perfectly formed than by that usually followed.

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5. For a *Machine for Manufacturing Bricks;* Richard Roberts, Berlin, Knox county, Ohio, March 2.

This machine is intended for pressing the bricks in the mould, for which purpose there are eight posts set round in a circle, and connected together by a circular plate at their upper ends, like upright studs for a circular room. On the outside of each of these posts there is a sliding piece of timber, secured to it by staples, which pieces, by being forced down, press the brick between their lower ends, and a projection on the post along which they slide. In the centre of the circle there is a vertical shaft which is to be turned by means of sweeps, and on the upper end of this shaft is a circular disk, which has upon its upper side, close to its periphery, several pieces, which act as cams, or lifters, and give to it the appearance of a crown wheel. These act upon levers which have their fulcra in the upper ends of the posts, to which they stand at right angles, their long arms pointing as radii towards the centre of the circle, and their short arms forcing down the pistons on the outside of each post.

There is no claim made, but it is said that "the advantages which this machine claims over others now in use, consist in great strength and durability, resulting from a judicious distribution of the materials it is composed of."

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6. For an improvement in the *Mould for casting Metal Spoons, mith a steel or iron bar along the handle;* Thomas Mix, Cheshire, New Haven county, Connecticut, March 5.

In the number for March last, p. 162, vol. xi. a mode is noticed of casting spoons which are strengthened by means of flat pieces of iron or steel wire along the handles, a patent having been obtained therefor by Mr. Charles Goodyear, of Philadelphia, August 11th, 1832. Mr. Goodyear casts the handle in two parts, and unites them by soldering, but the present patentee inserts the wire in the mould, before casting the spoon, a part of the wire projecting beyond the end of the handle, which part is to be cut and trimmed off. The moulds are made in the usual form, but one of the parts at the handle end, is about half an inch longer than the other, and to this is secured the iron or steel wire, in such a way that it shall not touch the inside of the mould, but allow the metal to flow round it. The wire is to be tinned, before it is inserted. The claim is to the particular plan described, of holding the steel or iron at the end of the handle, so that it may be extended entirely through the handle into the bowl, without touching, or coming in contact with, the mouldings.

We do not think that this patent interferes with the former, Mr. Goodyear having confined himself to his particular mode. Had he been well advised, however, he would have made his claim more broad, and have embraced the inserting of an iron or steel wire, generally, for the purpose of strengthening the handle of a cast metal spoon.

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7. For an *Apparatus for the treatment of Fractures and Artificial Joints;* William Wood, Smithfield, Jefferson county, Ohio, March 5.

This is essentially the same with the apparatus described in vol. xi. p. 26, and which itself was noticed as similar to instruments well known to the surgeon, and published in surgical works. Mr. Wood does not designate any thing which he claims as new, and has therefore failed in the plain requirements of the patent law, and secured nothing.

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8. For an improvement in the *Bar Share or Fallow Plough;* Gideon Davis, Georgetown, District of Columbia. First patented October 1st, 1825. Patent surrendered, cancelled, and reissued, March 6.

(See abstract of the specification, p. 244 of the last volume.)

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9. For *Softening Hides for Tanning;* Willis Berry, New Shane, Kennebeck county, Maine, March 6.

A vat sufficiently large to hold twenty-five hides, is to be so far filled with water as to allow room to receive the hides. Half a bushel of lime, the same quantity of ashes, twelve pounds of potash, five pounds of oil of vitriol, and four of muriatic acid, are to be added to the water, and incorporated with it by stirring; the hides are then to be passed into the liquid, and to remain in it for three or four days, when they are to be taken out and split. If not sufficiently softened they must be put into the lime vat, and remain there until they are so. Another vat is then to be prepared, and is to receive a bushel of ashes, and of slaked lime, with four pounds of potash; from this vat the hides are to be drawn every other day, until they are well raised, and the hair loosened, which may require six or seven days. After this, they are to be put into good lime liquor, until fit to unhair; then put into the second vat for one day, and fleshed; they are to be worked on the grain the next day, when they will be prepared for tanning, as usual.

For upper leather hides and calf skins, the process is nearly the same.

The chemist will at once perceive that the patentee proceeds altogether empirically, and that the good effect, if any, which is produced by the oil of vitriol, muriatic acid, lime, ashes, and potash, may be obtained by using the salts which will be formed in the vat as soon as these articles come into contact with each other. The patentee has made no claim, and is therefore limited to the use of the ingredients which he has specifically prescribed.

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10. For a *Churn;* Webber Furbish, Hallowell, Kennebeck county, Maine, March 1.

This churn is intended to facilitate the making of butter, by lessening the labour usually required. This is to be effected by the machinery described, which is called "*Furbish's application of lever power to churning.*" This lever power is intended to cheat nature out of her rights, by connecting two or three wheels, a band, a crank, and two or three levers, in such a way that the analysis of them

will involve her in some difficulty, and induce her, from sheer idleness, to allow them to gain power, without any assertion of her claims. The patentee, however, has not omitted his own, but says, "I claim the invention of the whole of this machine; that is to say, the application of the several wheels, the band, sweep, and lever, in this form, and for this purpose, or for any other purpose to which this machine and this power, in this form, can be applied."

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11. For a *Machine for punching and bending Wheel Hoops or Tires;* William Hinds, Springfield, Otsego county, New York, March 7.

The punching machine is merely a bed, to receive a piece of steel with a hole of the size required, and a second piece of iron perforated to serve as a guide to the punches to be used. The bending apparatus is intended to bend the tire without heating it. This consists merely of a lever, one end of which is placed under a staple, or stirrup, which is its fulcrum. The lower side of the lever, close to the fulcrum is to be made convex, or, to have convex pieces attached to it. The bed of the machine is of wood, and the iron to be bent is passed between the convex part of the lever and the wooden bed, where it will be bent by depressing the lever. "The invention of the machine, on the different principles specified and described, is claimed."

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12. For a *Machine for Striking Brick;* Andrew W. Duty, Sangerfield, Oneida county, New York, March 7.

This is, in fact, a brick press and striker. The prepared clay is to be put into a hopper, the opening in the bottom of which is of such size as will correspond with the mould to be passed under it. A piston extends from side to side of the hopper, its width being equal to the length of a brick. This piston is forced down and raised by a toothed segment on the end of a lever, which works into a rack on a vertical shaft. The moulds, placed on a firm carriage, are passed under the hopper by another lever, operating in a similar way on a horizontal shaft. When the mould has arrived at its proper place, the pressing lever is forced down, and causes the piston to descend and fill it. The mould is then withdrawn by the other lever, a striker, properly placed, acting upon the surface, and leaving the pressed bricks perfectly smooth.

The machine, with its appendages, is described at length, but there is no claim made.

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13. For *Canal Boats,* to be propelled by steam or other power; Francis Albert Dorman, Norfolk, Norfolk county, Virginia, March 7.

The patentee reasons with great confidence on the beneficial effects which are to result from the construction of canal boats with paddle wheels upon his plan, and which he calls parry-waves. In several points, however, we are unable to follow him to his conclu-

sions, which probably arises from our not exactly understanding his views. We are fully of opinion, however, from the whole aspect of the contrivance, that the project is an untried one, and that, in certain particulars, at least, the experience connected with it will contradict the theory; an event by no means uncommon.

These canal boats are to be made with flat bottoms, allowing one foot of water between them and the bottom of the canal. The paddle wheels are to have their paddles made of iron or brass, metal being much preferable to wood for this purpose. They are not to run in straight lines from rim to rim of the paddle wheel, but are to form an angle in the centre, thus ⌄. The paddle wheel, we are told, then "presents an angle to the mass of water, strikes it with a velocity equal to that of the water, separates it, and prevents the shock. The hinder part being concave, in striking the water, unites it, and prevents its escape; and at the end of the rotation, (the paddle being always perpendicular, they exert the same power till they leave the water,) leave the water without raising one single particle, which is a great defect in straight paddles that raise an immense quantity." We hope our readers will be better able to comprehend this than we are. How the paddles are to leave the water perpendicularly we know not, as they are fixed to the arms in the usual way; and even if they did do so, we cannot tell by what unseen influence they are at that moment "to exert the same power," and to do many other things. We have not room, however, for the statement of all our difficulties in this matter, and shall therefore cease to urge them, giving nothing further than an abstract of the description of some other parts.

The "*parry-waves*" are a sort of lattice work, extending along the sides of the boat, without the wheels on each side. If the boat has a draft of three feet, these parry-waves are to have a height of four feet, extending one foot above the water level. They are to be twenty five feet long, to be made of iron or brass, with openings five inches wide, and three inches apart.

The wheels may be placed in front of the boat, in which case there may be two of them on the same shaft, or there may be four wheels, two on each side.

The claim is to "the construction of the boat; the paddles of the wheels; the parry-waves, and the general combination."

There have been many contrivances, patented and unpatented, made with a view to prevent the waves from washing the banks of a canal, and which it has been hoped would allow of the giving to the boats a velocity greater than usual; and the only thing which seems to interfere with their efficiency, is the quantity of water displaced by the boat, the whole of which must, in its progress, flow from stem to stern, to fill up the cavity which would otherwise be left there. If there is any one among our numerous schemers who can contrive a boat which shall not displace its own weight of water, the goal will be reached, the victory achieved, and the crown awarded; for this discovery, however, we apprehend that we must await the *Greek calends*.

14. For an improvement in *Manufacturing Confectionary* of all kinds; Robert L. Stuart and Alexander Stuart, city of New York, March 7.

The patentees inform us that the discovery claimed by them "consists in the application of sirop, or sugar, purified by a steam process, exclusively for the manufacture of all kinds of dry confectionary, and lemon sirop."

The confectionary so manufactured is said to be more pure, and of a lighter colour than any heretofore made. In the claim the patentees say that they "do not claim as their invention either the apparatus, or steam process, for purifying sugar. But they herein claim the privilege of applying sirop, or sugar, purified by steam process, exclusively for the purpose of manufacturing confectionary; also for making lemon sirop."

The wooden boiler used, and the mode of introducing steam through tubes, is described, but as this is confessedly not new we need not remark upon it; there appears, however, to be some reason to doubt the validity of what is claimed as a "discovery." Every one, understanding the subject, knew that sirop, or sugar, purified by steam process, would make good confectionary, and lemon sirop; and every one, before this patent was obtained, was at liberty to apply such sirop, or sugar, to all purposes to which sirop and sugar are usually applied. There appears to us to be no more ground for the making such a claim, than there would be to the use of such sugar, or sirop, to the sweetening of tea and coffee, provided it had not been so employed.

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15. For *Machinery for Making and Pegging Shoes;* Saml. Preston, Danviers, Essex county, Massachusetts, March 8.

This is an ingeniously contrived, and, we think, a well arranged apparatus for making shoes, fastened by wooden or metallic pegs. The specification is of considerable length, and although it describes the machine clearly, it would require an engraved plate for its illustration. The claims made are the following:—

"What I claim as my own invention in the within described apparatus, is that arrangement thereof by means of the intermitters, or a single intermitter, or other analogous contrivance, with the guides, and other appendages, by means of which the shoe carriage is caused to advance with the shoe thereon, whilst the pistons carrying the awls and drivers, receive, by means of guides, or formers, a lateral motion, following the shape of the sole of the shoe; whether these motions be effected precisely in the way described, or in any other producing a similar effect.

"I claim also the arrangement of the parts of the machinery by which the pegs, or nails, are driven by one set of pistons, in the holes made by the awls in the pistons by their previous descent.

"I claim, likewise, the splitting the peg from the end of a slip of pegwood, or the cutting of pegs or nails, from a strip of metal, and the instantaneous driving thereof into the proper place.

"I further claim the application of the forcing apparatus, the piston, and also the forcing wheel, and the method, subsequently described, of smoothing and polishing by means of revolving wheels."

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16. For a *Horizontal Wind Mill;* Solomon Deming, Brunswick, Madeira county, Ohio, March 8.

There is some obscurity about the description of this contrivance, but still, through the palpable obscure, we can perceive enough to convince us that the difficulties which have hitherto attended the use of horizontal wind mills, will not be removed by the present modification of them. A vertical shaft is to be erected, and to arms, or heads which it carries, there are to be attached about twelve vertical wings, upon which the wind is to operate. The wings are to stand at an angle of about fourteen degrees with the shaft. This part is to be surrounded by frame work, sustaining eight, or any other suitable number of doors, hinged to vertical posts. These are to be opened or closed by cords and pulleys, to admit or arrest the wind, according to circumstances.

The invention claimed is "the before described wind wheel, particularly the wings or fans attached to the arms, or heads, the shutters for letting on and off the wind; and the ropes, weights, and pulleys by which they are opened and shut."

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17. For a *Cooking Stove;* Henry L. Bidwell, Berlin, Hartford county, Connecticut, March 8.

This apparatus is called a *Digesting Furnace or Cooking Stove,* and it is represented as being divided into two parts; the fireplace, and the *Athanor,* or digesting furnace. The fireplace may be in the form of the common Franklin stove, with doors in front to close it. The *athanor,* or digesting furnace, projects back behind the fireplace. Suppose, for example, the top plate of the stove to extend back beyond the body of it for two feet or more, and a second plate of the same size to be placed parallel to, and about four inches below it; these two plates, when enclosed at the sides, would form a wide horizontal flue, at the back of the fireplace. At the extreme end of this, there is a pipe, or other suitable exit, for the smoke. The upper plate of this *athanor* is to be perforated to receive pots, kettles, stew pans, &c.; and there may be two perforations of larger size through that part which forms the top of the stove immediately over the fire. A ring, or hoop, is to be passed within each of the openings in the *athanor,* to extend from the top to the bottom plate, so that when the cooking utensils are removed, the smoke will not escape. Dampers, shutters, or throttle valves, are to be inserted so as to cut off, lessen, or direct the draft.

We suspect that the placing of the above named rings, or rims, between the heated air and the cooking utensils, will be found to be bad economy, as it will be a little like placing one pot within another, and however closely they may fit together, the interchange of heat

between them will be very slow compared with that which would result from the direct action of the fire.

The parts claimed "are all those specially designated under the second head, called the *athanor*, or digesting chamber."

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18. For an improvement in *Pumps for Water;* Martin Mettee, Baltimore, Maryland, March 9.

On the 20th of May, 1830, Mr. Mettee obtained a patent for an improvement in pumps, with a view to prevent the introduction of stones and other injurious substances into them, a notice of which patent will be found at p. 85, vol. vi. The present patent has the same object in view, and the patentee has manifestly taken great pains to accomplish it. The specification consists entirely of references to the drawings, which are fifty-six in number, showing his mode of forming and connecting the various parts appertaining to the handle and spout, to which his improvements are confined.

At the close of his specification he says that after a careful examination, "I believe the improvements embraced in these drawings and descriptions to be of my own invention, yet I wish it to be distinctly understood, that I claim nothing in either the principle or the application which shall not prove to be my own, and new."

Be it remembered, however, that to divide the chaff from the wheat, the old from the new, belongs not to the public, but to the patentee, and that the saving clause which he has introduced, as expressive of his good intentions, will not be as dust in the balance of the scales held in the hands of justice, or rather, perhaps, of law.

We see no reason on the present occasion, to modify the remarks made on the former patent, but think them, generally speaking, perfectly applicable to the present.

When we noticed Mr. Kreig's pump, (No. 11 in the Journal for last month,) we were impressed with the idea that this second patent to Mr. Mettee was of later date than that before us; this, however, is a mistake of no importance whatever.

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19. For a *Safety Chain to be used in careening Ships;* James Fales and Thomas D. Brown. New Bedford, Bristol county, Massachusetts, March 9.

The safety chain is intended to brace the mast, by connecting one end of it to the top of the mast, and the other end to chains connected with the wales. The chain leading from the top of the mast, is to be connected to those attached to the wales by the intermedium of a screw, which turns in nuts attached to the chains, and by which they may be rendered tort. These chains are to be fixed on the side opposite to that on which the vessel is to be hauled down.

The claim is to the connecting such chains in the manner, and for the purposes described.

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20. For an improvement in the *Broad Power Loom;* John Leland, Milbury, Worcester county, Massachusetts, March 9.

After describing the construction of the loom, it is observed that in all the power looms now in use, the shuttle is driven by means of stud collars inserted into the cams by which the harness is operated; and that the usual number of beats, or jerks, for a loom weaving cloth of from ten to twelve quarters wide, is forty per minute; and as the cams in a loom for plain cloth revolve but half the number of times the lathe beats, and but a quarter of the number for kersey, the motion given to the stud rollers is very slow, which requires the inclined planes of the picker shoe, where the stud rollers are received, to be very steep or abrupt, in order to give sufficient force to the shuttle; and the motion thus given to the shuttle is a very hard and unnatural one, producing a trembling and agitation throughout the whole loom. To obviate this difficulty, and construct a loom in which the shuttle motion shall remain the same, not only for plain cloth but for kersey, or any kind of double work, is the object of this improvement, which consists, first, in placing the lathe shaft in such a position in the loom as to admit of its operating not only the vibrating cams, but of its driving the shuttle. Secondly, in ranging the vibrating cams to the pivots on which the lathe standards rest, and hanging them to the same. Thirdly, in motioning the shuttle with but one stud roller, and one picker treadle.

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21. For a *Machine for Cutting Straw, Hay, &c.;* James Luckey, city of New York, March 9.

This cutting machine is self-feeding, and differs in the mode of effecting this, as well as in other respects, from any of those cutting machines which we have previously seen. The straw to be cut is put into a hopper, and descends by its gravity, so that its ends project through the opening at the lower end, which is in the form of a flat spout. The straw rests upon a table placed at such distance below the end of the hopper as is equal to the length to be given to the cut straw; this table is adjustable by screws. The cutting knife is fixed across a frame which is made to traverse horizontally backward and forward, under the end of the hopper. It is placed obliquely, and has two cutting edges, causing it to operate in passing each way.

When used for hay, one side of the lower part of the hopper is hinged, and has a spring bearing on the outside of it to compress the material to be cut. The knife, in this case, has but one cutting edge acting towards the fixed side of the trough. Some provision will certainly be required for forcing the hay down through the hopper, otherwise it will, from its elasticity, bear against its sides, so as to prevent its descending by its own gravity.—The claim is "to the before described machine."

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22. For a *Washing Machine,* to be used also as a *Churn;* Oliver H. Brooks, Bethel, Windsor county, Vermont, March 11.

A trough is to be made in which there are to be two sliding blocks of wood, nearly touching its bottom; each of them attached to rods by which they swing from end to end of the trough, like pendulums. The

ends of the trough are to be fluted or reeded like wash-boards. The pendulous pieces are made to vibrate in opposite directions, by means of a compound lever fixed at one end of the trough.

We do not think this a good washing machine, and view it with still less favour as a churn: there is, moreover, little novelty in its construction, double blocks having been before made to vibrate in a trough in reversed directions.

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23. For a *Reacting Water Wheel;* Robert Eastman, Concord, Merrimack county, New Hampshire, March 11.

(See specification at p. 320 of the last volume.)

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24. For an improvement in the *Wool Carding Machine;* John Boynton, Coventry, Tolland county, Connecticut, March 11.

The improvement here patented is in the form, and the manner of driving the tubes for giving the countertwist to, or condensing wool or cotton roping. The tubes are to be trumpet mouthed, and in this consists their improvement in form. They are to be made of cast iron, about one inch in diameter, and the outsides of them are to be cylindrical. They rest upon a revolving strap, which passes over a rail beneath them, their friction upon this strap, from their own gravity, being sufficient to drive them. These two points only are claimed; but as the tubes have been already patented, as long ago, at least, as the year 1826, and have been made by Mr. Goulding and others in a great variety of forms, we are apprehensive that a variation in the mode of driving them will not enable its contriver to take the invention of another, and apply it to his own use, unless this invention may, from some cause, have become public property. The patent law, and the practice under it, discountenance such a procedure, which, if tolerated, would leave the "true and original inventor" at the mercy of every one who had ingenuity enough to vary the form of a thing, whilst it remained substantially unchanged.

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25. For a *Rotary Steam Engine;* Abraham Potts, and Benjamin F. Pomeroy, Pottsville, Schuylkill county, Pennsylvania, March 11.

A wheel is to revolve by the action of steam introduced into it through a hollow shaft, and passing thence through four curved spokes, or channels, within the wheel, is delivered tangentically at its periphery. The wheel is represented in the form shown in the sketch.

This "new and useful" improvement will be found to be old and useless. It is a mere variation in the form of the oldest steam engine upon record. In the curved steam channels there is no use whatever; the wheel might as well be a drum, with

openings at its periphery, directed tangentically. This same plan has undergone numerous modifications, to one of which only we will now advert. On the 8th of April, 1829, (See vol. iv. p. 53,) Mr. Elijah Bryan, of the city of New York, obtained a patent for a similar contrivance, to be applied to the driving of carriages. The steam was to pass through hollow axles into the hub of the wheel, and then through curved spokes, whence it was to be delivered at the periphery.

The claim, in the present patent, is to "the introducing the steam as before described by the hollow shaft; also the steam buckets, and mode in which they act." By the *steam buckets* are intended the curved channels.

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26. For an improved *Water Wheel;* Richard Walker, Milton, Strafford county, New Hampshire, March 12.

There is much resemblance between this water wheel, and the rotary steam engine just described. The wheel is to run horizontally like Wing's and most of the other reaction wheels, and from its centre to its periphery, it is to have three channels, or water ways, constructed like the four in the foregoing rotary engine. The water is to be conducted down through a vertical trunk, then horizontally, and then up through a tube into the centre of the wheel on its lower side. The pressure of the water thus forces the wheel upwards, and counteracts the effects of its own gravity, and that of its appendages. The wheel must, of course, fit closely to the tube through which it receives its supply.

It appears that the patentee makes large calculations upon the curved form of the outlets, as he informs us that "the continual pressure of water on the outer circle, gives the wheel its motion." We can assure him, however, that he may apply our remark respecting the rotary engine to his wheel; make it a drum, leaving only the proper openings in the periphery, and he will lose nothing in its action, whilst he will gain something in the labour of construction. If the "continual pressure of the water on the outer circle gives the wheel its motion," is there not an equal pressure upon the inner circle, and what is the effect of that?

The claim is to the "taking in the water on the under side of the wheel, with an upward bearing, by which the wheel is relieved of its own gravity, to the full amount of the force of the column of water taken in; and the construction of the wheel to make the water act with full force from the centre outward in every part alike at one and the same time, through said buckets or semicircular outlets by which the wheel gains its motion." We cannot say any more in favour of the novelty of the upward pressure, than we have said of the novelty and utility of the curved channels.

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27. For a machine for *Hulling Clover Seed;* Jacob Gans, Fayette county, Pennsylvania, March 12.

A cylinder covered with sheet iron, punched like a grater, is to

turn in a concave with a similar covering. The claim "in the before described machine for hulling clover seed, is, its general arrangements and combination for the purpose above set forth." We know of no machine for the purpose which could lay claim to greater antiquity, although this is a claim which the patentee has not urged.

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28. For an improvement in the *Cans used in the manufacture of Cotton;* Horatio Moses, Paterson, Essex county, New Jersey, March 12.

A hoop of cast, or of malleable iron is to surround the top of the can, "for which improvement the patent is claimed." The description of this invention employs only thirty-one words, including the references to the drawing. On the 20th of July, 1831, John Butterworth, of Philadelphia, obtained a patent for putting iron hoops on the bottoms of drawing cans; we have now one for hooping the top, and perhaps some one may find room enough in the middle for a third; a man, then, by the purchase of three rights, may hoop his cans completely with iron. If it is desirable to give greater strength and permanence to the tops of cans than has been usually given, would not this end be accomplished were the tinman to surround them with one or two large wires in the ordinary way of wiring edges? this, we presume, would not interfere with the patent, although hoops of malleable iron would be employed.

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29. For a *Mortising Machine;* George Page, Keene, Cheshire county, New Hampshire, March 13.

This machine is described at great length, but the drawing which accompanies it is but indifferently executed. There is enough, however, to show that, in its general operation, it resembles most of the mortising machines which have preceded it; and, indeed, as there are many of them, it is scarcely to be expected that much novelty would appear in a new machine for performing this simple operation. The claims are necessarily confined to matters of mere arrangement; and most of them are of a character rather trivial; they consist in the rotary motion of a slide; a wire guide; steel springs and grooves; a clevis and pins; the increasing or diminishing the power of a lever, by holes changing its fulcrum; a round socket in the slide, and a round shank to the chisel, allowing it to be put askew; and a driver for removing the chips.

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30. For an improvement in *Lamps;* Ira Crouch and James A. Frary, Meriden, New Haven county, Connecticut, March 13.

This is a hanging lamp, the body, or reservoir, of which is a tube bent round in the form of a ring, having an exterior diameter of about seven, and an interior of about four inches; this tubular reservoir will hold about one pint of oil. Four tubes for wicks extend from the inside towards the centre of the hoop, bending upwards, and leaving a central space of about two inches in diameter. The burners may

have spaces of an inch in breadth, and one-eighth of an inch in thickness; over these a glass chimney is to be placed.

As regards claim, the patentees say "we do not claim as our own invention the central opening merely, for a downward light; that has long been known and used. But we do claim as our invention the circular band, and the peculiar form and construction of our lamp."

On the 3d of March, 1831, Mr. Lawrence, of Meriden, obtained a patent for a lamp essentially like the foregoing, of which there is a description in vol. viii. p. 18; and another patent by the same gentleman for nearly the same thing, may also be found in vol. xi. p. 311. The main difference between these and the one before us being in the shape of the ring-like reservoir for oil; the present patentee makes the tube of which the ring is formed, oval, the longest diameter standing vertically: Mr. Lawrence made his of segments of two circles, as may be seen by turning to the articles referred to; this, we think, is one of those changes of form which would not, in law, be deemed an improvement.

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31. For *Cementing Cloth;* Reuben Brackett, Boston, Massachusetts, March 14.

The cementing is to be effected by means of a solution of India rubber, so as to unite two edges together without sewing, and in this the whole claim consists; such solutions, therefore, are to be used as are already known.

The cementing of cloth, by means of a solution of caoutchouc is not a novel process; water proof cloth having been prepared in England and France by cementing together two thicknesses, for the purpose of making cloaks and other articles. Cloths of two colours have sometimes been so united, when it was desired to have the lining of one, and the outside of another colour. As regards the uniting of seams in this way, it may undoubtedly be effected so as to render them perfectly firm, and we are not aware that the doing so has ever been proposed previously to the obtaining of the present patent. Whether the appearance of the seams will be such as to please the eye, and whether the cementing can be effected without keeping the cloth under pressure for a period which may be inconvenient, are questions which the patentee has probably asked and answered.

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32. For *Frames, or Foundations, for Stocks, Cravats, &c.;* William, Merriam, Meriden, New Haven county, Connecticut, March 14.

The warp is to be laid of a proper width for the stock, and the filling is to be of hair, with the exception of two or three inches at each end of the stock, where flax or hemp is to be used, this serving the better to secure the hair, and to attach the straps, &c. The claim is as follows:—

"I do not claim as my invention the art of weaving hair cloth as it has been usually practiced, nor of weaving cloth of yarn filled with

hair; but I do claim as my invention the art of weaving bristles, in the manner and for the purposes above described."

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33. For a *Water Wheel;* Theodore Lomis, Athens, Bradford county, Pennsylvania, March 14.

The patentee has baptized his invention *Lomis' Submersive Hinge Bucket Water Wheel*; and, like its brethren of the hinged kind, it is to be driven by the force of a current in descending streams, or by the tide in rivers where it ebbs and flows. He says that "the principle invented and claimed as new by the author, is the wheel being placed in any water having motion." Had he been in the habit of reading our lucubrations, the pleasing dream of originality in this particular, would have been often and sadly disturbed; but, as "where ignorance is bliss, 'tis folly to be wise," he may have done well in having avoided this means of destroying his cherished anticipations. Having taken a patent, however, he must needs seek to prove its validity, and this will of necessity let in on him the full light of truth, and will, we fear, at the same time, dazzle and disturb him as it dissipates the clouds which have hitherto obstructed his vision.

In a wheel of this hinged construction, the patentee tells us that "the surface of the buckets on one side of the wheel is operated upon, giving it motion; while the buckets on the other side, folding outward, return to their places of labour edgewise, and when receiving the water are at their proper place of labour without friction."

Instead of repeating, we will merely refer to our observations on similar wheels, which may be found in nearly every volume of this journal.

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34. For a *Machine for Breaking Corn;* Webber Furbish, Hallowell, Kennebeck county, Maine, March 15.

Two iron rollers of about two inches in diameter, are to be placed parallel to each other, nearly in contact, and in the same horizontal plane; one of them is to be smooth; and the other fluted. A cog wheel takes into a pinion on the shaft of the fluted roll, and the corn to be broken is to be fed to the rollers by a hopper. The patentee claims "the position and application of the different parts of this machine, in the form, and for the purposes, to which it will be devoted."

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35. For a *Metallic Nipple Shield,* or artificial Nipple; John J. Heintzleman, city of Philadelphia, March 16.

A metallic shield is to be made of silver, tin, or other suitable metal. This shield is made trumpet mouthed to receive the nipple, its extreme diameter where it lies on the breast being nearly two inches. At its upper part it is perforated by several small holes; above these extends a tubular part over which is slid what is denominated a guard, against which the lips of the child will press in the act of sucking. The artificial nipple is a hollow piece of metal, adapted to the parts above described in such a way that by the intervention of a spiral

spring a degree of elasticity is given to the guard which relieves the mouth of the child.

The claims are to the general construction of the whole, with the application of a spring, affording the required degree of elasticity. A covering of gum elastic, or other material, it is observed, may be employed to give softness to the nipple part of the apparatus. It is proposed also to apply the elastic nipple to a bottle, when it becomes necessary to use one for the nourishing of the child.

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36. For a *Contracting Iron Band;* Edward Cooper, Richmond, Virginia, March 16.

It has been common on vats and other large circular vessels to put hoops which are tightened by a wedge driven through loops in the ends of the hoop; the object of this contrivance is similar, but the arrangement of the parts different. The ends of the hoop are to lap over, and they are so formed that a wedge driven in between them operates to draw them together, something in the manner of a spliced girder. The patentee says that these bands may be put round boxes, kegs, &c., but they certainly would be too expensive for such articles. A sea captain, who saw the model in the patent office, has suggested the idea that they are better adapted to the hooping of masts than any thing now in use for that purpose.

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37. For a *Mode of protecting Hay and Grain from the weather;* Francis Wright, Hallowell, Kennebeck county, Maine, March 19.

Tarpaulins are to be made of a suitable size, and are to have strings at their corners to fasten them to small stakes which are to be driven into the ground, when they will serve to protect the stacks or cocks from the weather. The claim is to the employment of coverings in this way.

We know not how many persons may have suggested the same idea, but we can answer for ourselves, that more than thirty years since, when boarding at a farm house, we proposed this plan to the farmer, and he at first entertained the idea of putting it into practice; but upon further consideration, came to the conclusion, that the number of such coverings which must be procured, the time they must lie idle, their stowage, removal, wear and tear, &c. would render them a bad speculation. We dare say the farmer was right, and that most of that class of citizens, were they to reflect upon the subject, would arrive at the same conclusion; perhaps, however, the stimulus of a patent mode may suddenly arouse their dormant energies, and induce some of them, without reflecting, to "*buy a right.*"

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38. For a *Machine for Cutting Sausage Meat;* Joseph Wagoner, Brunswick, Schuylkill county, Pennsylvania, March 19.

A cylindrical piece, set with steel teeth, knives, or points, is to revolve in a hollow cylinder, or tube, having also rows of teeth along it. The meat is to be fed from a hopper placed above one end of the

machine, which lies horizontally. The revolving cylinder immediately under the hopper is cut screw fashion to carry the meat forward in order that it may be acted upon by the teeth, or knives. The space between the cylinder and tube decreases as the meat recedes from the hopper, and passes towards the point of delivery, where the annular opening is to be small. Although this machine is intended to make minced meat which may be easily swallowed, we have some fear that it will choak itself in the operation.

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39. For a *Machine for rolling metallic plates, with projections, or teeth, thereon,* for covering cylinders and concave beds of machines for rubbing out clover seed, shelling corn, thrashing grain, &c.; Robert Rittenhouse, Amwell, Hunterdon county, New Jersey, March 19.

Two hard, metallic rollers are to be mounted in the ordinary mode of mounting a flatting mill. One of the rollers is to have indentations of such form, and in such relative numbers, as may be required on the plate. The other roller is to be smooth, and between the two the plates of iron are to be rolled in the usual way.

When steel plates are required, they are to be first decarbonated, then rolled, and recarbonated.

The claim is to the making of such plates, adapted to the purpose designated.

The main difficulty which presents itself in attaining the end here proposed, results from the necessity of raising the asperities to the full height at one rolling, as the plate will stretch in the operation, and render it impossible to send it through a second time. If this can be effected, the article produced will no doubt be valuable when applied to the above purposes.

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40. For an improvement in the *Machine for rubbing out Clover Seed, Shelling Indian Corn, &c. &c.:* Robert Rittenhouse, Amwell, Hunterdon county, New Jersey, March 19.

This patent is taken for using the plates rolled out by the foregoing machine, it being expressly stated that no claim whatever is made to any improvement in the general form of the machine.

This does really appear very much like taking two patents for the same thing. The first being for "a new manufacture," the second for the right to use the thing made. If the patentee disposes of a right to his first patent, must the purchaser buy a second right to use it? Can a man take a patent for a new manufacture of fire arms, and compel those who buy his guns to purchase also a right to shoot with them? If I buy cloth of a new kind, which has been patented, is it possible that the patentee can compel me to purchase a right to put my own cloth into the hands of the tailor before it can be made up? "May be so, but may be not."

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41. For an improvement in the *Roller Gin for Ginning Cot-*

ton; William Whittemore, senr., and William Whittemore, jr., West Cambridge, Middlesex county, Massachusetts, March 21.

A very minute description of the roller gin is given in the specification, which refers throughout to perspective and sectional drawings. The parts which are claimed as new are plainly designated, and consist of "the guard, felts, and clearer." *The guard* is a piece of cast steel, which works upon two arms in the frame of the ginning rollers, its lower edge, which is to be about one-sixteenth of an inch thick, smooth, and rounded, drops nearly into contact with the felt or the lower roller. The object of this is effectually to prevent the seeds of cotton from being drawn in with the staple between the rollers. *The felts* are endless aprons of leather, which are substituted for cloth, as possessing many properties which render it superior to the latter article. Of these *felts* there are three, with their appropriate rollers; one of these is the feeding apron; the other two receive the cotton and carry it along from the ginning rollers, round which they pass. The upper apron inclines upward, and the lower apron downward; a part of the cotton adheres to the upper felt, but the larger portion of it to the lower one. *The clearer* is a frame worked up and down by a double crank shaft, having two combs attached to it, like those of the common carding machine, and serving, in a similar way, to remove the ginned cotton from the felts.

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42. For a *Machine for making Window Sash, Panel Doors, &c. &c.;* John Tichenor, Ithica, Tompkins county, New York, March 21.

Machinery for sawing, planing, sawing tenons, mortising and boreing, is described by the patentee, though in a very loose and indistinct manner. A claim is then made to "the before described machine for making window sash, panel doors, window blinds, &c., as a whole, and not its individual parts; but the general arrangement and construction of them to effect the above purposes."

A claim like this is sometimes a very good one, but this must, evidently, depend upon the ownership of the individual parts so combined together. If these are all public property, and I combine them in a new way so as to produce a new and useful result, the combination is my own; but there must in this case be something quite specific in the mode of combination. If, however, I take Mr. Woodworth's, or any other person's planing machine, and place it in company with other apparatus which I may legitimately use, neither justice or law will warrant my so doing. The patentee specifies his mode of planing to be by "a circular cylinder, with cast steel knives, or cutters, under which I pass the stuff to be planed, while the cutters are in rapid motion." This may serve as a general sample of the novelty of the invention which is claimed "as a whole."

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43. For improvements on the *Machine for Cutting Wooden Screws and Nuts;* Alexander Patton, Columbus, Franklin county, Ohio March 21.

The principal point claimed in the present patent is the cutting of the nut, or female screw, by turning the cutting shaft in a direction the reverse of that heretofore followed. A wooden screw, with a thread the size of that to be cut, is fixed in a frame, and passes through a tapped hole in it; the thread is turned off from the end of the shaft allowing it to pass through the bored piece in which a nut is to be formed, and to this the frame is firmly attached. On to the extreme end of the shaft, on the back side of the nut, is fitted a collar, carrying two or more V cutters; when by turning the screw, by means of a lever, in the manner of unscrewing "the Vs thus cut through, leaving as they cut the chips in the blocks cut. The improvement for which a patent is claimed consists in the cutting of the flutes of a nut by the reversed motion of the shaft, whereby the chips are left clear of the Vs. The facility of adding as many cutters as is thought proper, and the steady movement of the Vs by means of the nut and screw of the shaft."

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44. For a *Cooking Apparatus;* Thomas K. Anderson, Boston, Massachusetts, March 22.

The form of the part of this apparatus in which the fire is contained, is that of the common cylindrical stove, with its grate and ash pit. This cylinder is surrounded by a second, extending from the bottom of the former to about two-thirds of its height. This is made tight, to contain water in which to boil meat or vegetables. The top of the interior cylinder is surmounted by an oven, which is surrounded by a casing, for the conveyance of heated air and smoke, which must have an outlet at top. In this oven, baking, frying, stewing, &c. are to be performed.

"The inventor claims as his invention the combination of apparatus above described, and its arrangement for the purposes set forth."

We do not perceive upon the face of this arrangement any thing which recommends it to special favour. The cylindrical vessel in which meat and vegetables are to be boiled, is attached firmly to the stove, and the fluid must be drawn from it by means of cocks. It cannot be removed to be rinced and wiped by the cook, which, among those who are cleanly, is a point of some importance. The oven, or case, at top, is less *comeatable* than it ought to be, and in general it appears likely to give out too much of the odour of the good things before they are ready for the table; a defect very common in cooking stoves.

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45. For a *Mode of Manufacturing Leaden Pipes;* George W. Potter, Otsego, Otsego county, New York, March 23.

The apparatus which is the subject of this patent is intended to cast lead pipes of any required length, without the necessity of soldering separate pieces together.

The cast iron tube which forms the mould for the pipe is placed horizontally, and passes through a cast iron box which is to be supplied with cold water. The back end of this tube extends through

the water box, into another which is a receptable for melted lead. A core, the size of the bore of the tube, extends through it and into the reservoir, where it is supported by one end, without the necessity of any thing to sustain it, either within, or at the mouth of the tube. Above the cast iron reservoir of lead, there are two force pumps of iron, the pistons of which are made to operate alternately. When one of the pistons is raised, melted lead runs into the barrel, from a trough supplied for that purpose. At the bottom of each pump barrel there is a suitable valve, to prevent the return of the lead.

When the apparatus is used, it must, in all the parts containing fused lead, be surrounded by burning coals, so as to keep the metal in that state.

The claim is to "the pressing, or receiving the fused lead into a tube, around a rod, and cooling it in its passage through the tube, in the manner before described, and thus forming the pipe."

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46. For an improvement in the *Plough;* Henry Spiehlman of Strasburg, and Daniel Miller, of Raphoe, Lancaster county, Pennsylvania, March 25.

The points stated to constitute the improvements, are the shape and construction of the mouldboard; the plate by which it is fastened to the plough, and a plate on the landside. The description is obscure in relation to each of these proposed improvements, and we are not told in what they differ from the like parts in other ploughs.

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47. For an improvement in the mode of *Guiding all Endless Bands, Belts, or Aprons* while in motion; Samuel Sawyer, Boston, Massachusetts, March 30.

This is a simple, and, we have no doubt, an effective instrument. The endless band, or apron, passes over a roller, fixed in a suitable frame, and turning upon gudgeons. The frame has a centre pin on its lower side, which passes down into a hole, that allows the frame with its roller to swivel round. A shank, or rod, extends out at right angles from the frame of the roller, and at a suitable distance it is crossed by another piece forming two arms, parallel to, and of about the same length with, the roller. Each of these arms is bent over at the end, to receive and embrace the edges of the band, or apron. Should the band, in motion, now deviate either to one side or the other, its edge will press against the turned over end of one of the arms, which will immediately cant the roller, and right the band.

The whole is clearly explained, and distinctly represented in the drawing, but the specification refers to the model, which it claims as making a part of the patent.

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48. For an improvement in the mode of *Cleaning and Ginning Cotton Wool,* and freeing it from the seeds, &c.; Samuel Sawyer, Boston, Massachusetts, March 30.

Between the two rollers, fixed in the manner of the ordinary roller gin, there is a third smaller roller, with its centres forward of them,

and occupying nearly the whole of the gripe between them. Around this smaller roller passes an endless apron, and as the cotton is fed to, and drawn in forcibly between the gin rollers, the minuteness of the spaces causes all seeds and other hard substances to be completely squeezed out, whilst the cotton is carried in upon the endless apron, and is taken off by a revolving belt cleaner. The guide roller, described in the specification last referred to, is applied to the endless apron in this machine.

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49. For an *Improvement in his method of Cleaning or Ginning Cotton Wool;* Samuel Sawyer, Boston, Massachusetts, March 30.

This improvement consists in applying a plate, or blade, of metal or wood, in contact, or nearly so, with the small roller carrying the apron, as described in the last specification. The cotton being fed between the blade and the roller, is drawn in, and the seeds, &c. completely excluded. This blade, which is called a preventer, it is observed, may be advantageously applied to the common roller gin.

There is a strong resemblance in the principle of operation, though but little in the mode of fixture, between this blade and the guard mentioned as applied to the roller gin of the Messrs. Whittemore, No. 41.

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50. For a mode of *Combining Rollers, with a connecting Belt, or Apron, whereby Fleece, or Skin Wool, may be held or strained over a surface, so that foreign substances may be removed;* Samuel Sawyer, Boston, Massachusetts, March 30.

An endless apron is held up against a fluted roller, by two small rollers, over which it passes. The fluted roller allows burs, or other foreign substances to pass between it and the apron without being crushed, and as the fleece passes over the smaller rollers, every thing of the kind is exhibited to view, and readily brushed or knocked off. We should make our description much too prolix were we to attempt a verbal explanation of the whole arrangement of this machinery. The guide roller is applied to the endless apron of the machine.

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51. For machinery for *Cleaning Animal Wool, &c.;* Samuel Couillon, jr., Boston, Massachusetts, March 30.

The specification of this patent extends over eleven closely written pages, which might, however, be reduced to two, if the repetitions and other redundancies were pruned away. We shall not attempt an analysis of the specification, and even the claim itself we shall condense very much. The former informs us that the object of the invention is the cleaning of animal wool from foreign substances, in the fleece, or otherwise; and that for this purpose the fibres of said wool are to be straightened in such a manner as to bring the burs or other foreign materials on the surface, when they are to be removed

"by scraping, cutting, pinching, blowing, or striking them off, as hereinbefore specified."

A further claim is to the mechanical arrangement of his machine, as described, with the exception of two small drawing rollers, invented by Samuel Sawyer, and used with his approbation.

The fleece is stretched by means of fluted, or other, rollers, over and between which it passes; from them it is drawn against a straight metallic edge, in passing which, the fleece is beaten by a revolving beater having projections on it, which serve to disentangle the fibres, to straighten them, and remove the foreign substances.

There appears to be considerable resemblance between this machine and that last described, not only as regards the object in view, but also in the mode of accomplishing it.

SPECIFICATIONS OF AMERICAN PATENTS.

Description of the Pennsylvania Edge Rail and Chair, for which a patent was granted to W. B. MITCHELL, *of the city of Philadelphia, February 27th,* 1833.*

TO THE EDITOR OF THE JOURNAL OF THE FRANKLIN INSTITUTE.

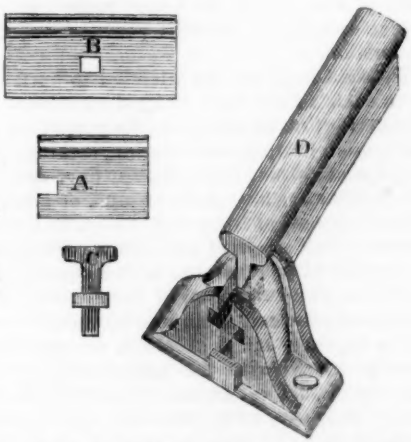
SIR,—I have just received your communication requesting me to furnish for publication in the Journal of the Franklin Institute, a description of the "Pennsylvania edge rail and chair."

In order that the objects which are endeavoured to be effected in the formation of this rail and chair, may be better understood, I shall in the first place point out some of the defects which have been discovered in the use of what is generally termed the "Clarence" rail. In a climate subject to so much variation in temperature as that of Pennsylvania, it is found that the expansion and contraction of the metal, very materially affects the fastenings of the Clarence rail in its chairs; the rail being more immediately exposed to the action of heat and cold, than the base of the chair, it follows that the expansion or contraction of the rail takes place, before a corresponding action is produced on the base of the chair. If the wedges in the Clarence rail be driven in extreme warm weather, they gradually become slack, as the temperature changes, and require almost constant attention in driving them, until the lowest degree of temperature takes place, at which time, if the wedges are driven perfectly tight, danger will result from the subsequent expansion of the rail, bursting off the jaw of the chair, before it can relieve itself by a corresponding expansion.

The wedges of the Clarence rail being exposed, are subject to drop out, or are easily removed by those who are disposed to do mischief. To remedy these and other defects, the "Pennsylvania Edge Rail

* It was intended to have published the specification of this patent, but the patentee has furnished the accompanying description, which will probably be more satisfactory than the official instrument itself.

and Chair" have been devised. In the construction of the rail, (with a view to economy,) such form was adopted as to give it the greatest degree of strength with the least weight of metal. It has a cap tread of the usual dimensions, but instead of a rib and *keel*, it is furnished with a rib only, and extending to such depth as will render it capable of supporting any required weight; the thickness of the rib not being increased beyond what is necessary to prevent its kinking by the weight which it is calculated to bear, (see drawing C.) At each end of the rail, about midway of the rib, is a notch, (see drawing A,) so that when the ends of two rails are placed together, the notches correspond and receive a key driven transversely of the rails, and extending outwards at each end, about half an inch—at the intermediate points of support in each rail are mortises through the rib to receive keys, similar to those at the joinings.



A. End of rail at junction.
B. At intermediate bearing.
C. End view with key.
D. Perspective view of rail and chair.

The exterior of the chair is similar in form to the Clarence chair; in the interior faces, on each chair, are grooves extending about two-thirds through the chair, longitudinally, and calculated for the reception of the keys already described; so that when the chairs are bolted to their supports, and the keys placed, the rail may be dropped into the chairs, and by being drawn longitudinally the keys will enter the grooves in the interior face of the chairs, and thus remain perfectly secure from external violence; the keys being made to fit the grooves, the rail remains perfectly firm and steady in its chairs, without the aid of wedges, and the strain and consequent reduction of strength in the chair, caused by driving the wedges, is altogether avoided. The key at the joining as it enters into both rails, preserves the vertical position of the joint, the want of which is so obvious to those who have travelled upon rail-ways secured by wedges only.

Very respectfully, yours,

W. B. MITCHELL.

Columbia and Philadelphia Rail-way Office, August 20th, 1833.

ENGLISH PATENTS.

To Samuel Jones, *manufacturer, for his invention of a certain improvement, or certain improvements, in apparatus, or part, or parts, of apparatus, for producing instantaneous light. Sealed 20th November,* 1832.

This invention applies to the mode or manner of making, manufacturing, or constructing of the matches to be used for producing instantaneous light, which said improved matches may be ignited by dipping the prepared ends in sulphuric acid contained in a bottle, as in common use; or they may be ignited by friction, produced by drawing the prepared end of the match between the rough surfaces of a piece of sand, glass, or emery paper; or in contact with any rough surface or body, which will produce sufficient friction to cause the combustion.

The said matches are intended to burn with a blaze or flame, similar to such as are used to light candles; or to burn with a slow or mouldering fire, as fusees, for the purpose of lighting cigars, pipes,&c.; and consist, first, in constructing, making, or forming the matches out of strips of cotton, linen, hemp, flax, tow, or other fibrous material, previously wove into cloth, or tape, or what is commonly called inkle; or from threads of linen flax, hemp, or tow, twisted or combined together; which strips of cloth, tape, or inkle, or combined threads, are to be covered or saturated with a coating of wax, resin, spermaceti, tallow, or any compound of them, which will burn with a blaze or flame, and answer the purpose intended.

The tapes, or strips of cloth, or combined threads, may be saturated or coated with the composition, by drawing them through a quantity of such inflammable material in a liquid state placed in a vessel; or it may be applied to the tapes, cloth, or combined threads, by hand with a brush, or in any other convenient manner. The tapes, or strips of cloth, or combined threads, being thus prepared with the inflammable material, are to be cut into suitable lengths required for the matches, and their ends primed or charged with a composition of chlorate of potash, compounded or mixed with antimony in combination with sulphur, (commonly called or known by the name of sulphuret of antimony,) or such other chemical compound as will ignite by friction, and answer the purpose; which said compound of chlorate of potash and sulphuret of antimony is to be mixed with a mucilage of gums, starch, flour, or glue, to render it sufficiently tenacious, so as to adhere to the ends of the strips of cloth, or tapes, or combined threads, which ends may, or may not, be previously prepared for the compound by dipping them in hot liquid sulphur, as may seem requisite. These matches are intended to be ignited by drawing the prepared end between the surface of sand paper, &c. as before stated.

Secondly, in making or manufacturing matches out of strips of paper, strips of cotton, or linen cloth, or tape, or inkle, or from threads

of linen, hemp, flax, or tow, combined, also from strips or pieces of wood, scale board, or shavings, all which said materials are to be saturated with a solution of nitrate or chlorate of potash, or any other chemical composition, which will cause them, when ignited, to burn with a slow or smouldering fire, as fusees. The materials, either before or after being prepared with the solution of nitrate or chlorate of potash, are to be cut into proper lengths for the matches; and when prepared with the solution, the ends are to be charged or primed with the foregoing compound of chlorate of potash and sulphuret of antimony, or any other chemical compound or composition which will ignite by friction, as before stated; and which matches, when so ignited, will not continue to blaze, but burn with a slow or smouldering fire, as fusees.

And thirdly, in making or manufacturing of matches from strips of wood, scale board, or shavings, or strips of wood, scale board, or shavings, covered with paper. Such said materials are to be saturated with a solution of nitrate, or chlorate, of potash, or any other chemical composition which will cause them to burn with a slow or smouldering fire, as fusees; which saturation may be effected either before or after the materials are cut into strips of the convenient size for matches.

The ends of the matches are then primed or charged with a composition or compound of chlorate of potash, mixed with camphor, sulphur, inflammable gums, or resins, farinaceous powders, powder produced from fungi, woods, bark, or vegetable fibre; or with vegetable sugars, and prepared or compounded with mucilage as above described, and in such proportions as will be found most convenient, or with any such other chemical compound as will ignite when brought into contact with sulphuric acid.

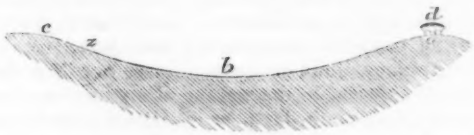
Having now described the nature of my said invention, and in what manner the same is to be performed, I wish it to be understood that I do not mean or intend to claim as my invention, any of the within named chemical compounds or compositions; nor do I claim the use of cotton threads or yarn, in the making of my improved matches, except when woven into cloth, tape, or inkle; but I do hereby claim as my invention, first, the making or manufacturing of matches from strips of cloth, or tape, or inkle, formed or woven from threads of cotton, linen, hemp, flax, tow, or other fibrous material; or from threads of linen, flax, hemp, or tow, twisted or combined together; which said materials are to be saturated or coated with the inflammable composition as before stated, to burn with a flame or blaze, and to be charged or primed so as to be ignited by friction. Secondly, in making or manufacturing matches from strips of paper, cotton, or linen cloth, tape, or inkle, wood, scale board, or shavings, or from threads of linen, hemp, flax, or tow, twisted or combined together, which materials are to be saturated with a solution of nitrate or chlorate of potash, or such other chemical composition as will cause them to burn with a slow or smouldering fire, as fusees, the ends of the matches being also primed to ignite by friction; and thirdly, in making matches from strips of wood, scale board, or shavings, either in

conjunction or not, with paper, and saturated with a solution of nitrate or chlorate of potash, or such other chemical composition as will cause them to burn with a slow or smouldering fire, and to be ignited by the action of sulphuric acid upon the priming, or charge, placed upon the ends of the matches.

[*Lond. Jour.*

To RICHARD BADNALL, *for his invention of an improvement in the construction or formation of the trams, or rails, or lines of rail, or tram-roads, upon which locomotive engines shall or may work. Sealed 8th September,* 1832.

This improvement in the construction or formation of the trams, or rails, or lines of rail, or tram roads, upon which locomotive engines shall or may work, will be best illustrated by reference to the oscillation of a pendulum. If a plummet suspended by a string from the point 2, be drawn away from the perpendicular line to the point *a*, and there let go, it will fall by its gravity to *b*, in the arc *a b*, but on its falling it will have acquired so much momentum as will carry it forward up to a similar altitude at point *c*. Let it be supposed that a line of rails or tram-way for carriages be so constructed from the summit of two hills across a valley, that the descent from the one hill as *a*, to the valley *b*, shall subtend a similar angle from the horizontal line, to the ascent up the other hill from *b* to *c*. Now if a tram wagon, as *d*, be placed at the summit of the



declivity *a*, it will, by its gravity alone, run down the descending line of rails to the lowest point *b*, but in so running, according to the principles of the oscillating pendulum, it should have acquired a momentum that would carry it forward without any additional force up the ascending line to the summit of the hill *c*, being at the same altitude as the hill *a*.

It is quite certain that this would really take place if the velocity of the momentum was not impeded by the friction of the wheels of the carriage upon their axles, and upon the rails on which they run. Hence, subtracting the amount of friction as a retarding force from the momentum which the carriage has acquired in descending from *a* to *b*, it will be perceived that the momentum alone would only impel the carriage part of the way up the ascent *b c*, say as far as *z*.

The patentee states in further explanation of his invention, that

"it will now be perceived that the carriage *d*, would not only pass down the descending line of road from *a* to *b* by its gravity, but that the momentum acquired in the descent would also impel it up the second hill as far as *z*, unassisted by any locomotive power. In order, therefore to raise the carriage to the top of the second hill, I have only to employ such an impelling force as would be sufficient to drive it from *z* to *c*, the whole expense of locomotive power for bringing the carriage from *a* to *z* being saved."

"If, now, I employ a small locomotive power to impel my carriage from *a* to *b*, I by that means obtain a greater momentum than would result from the descent of the carriage by gravity alone, and I am therefore enabled by that means to surmount the hill *b c*, having travelled the whole distance from *b* to *c* on the undulating line of road with much less locomotive power than would have been requisite to have impelled the carriage the same distance upon a perfectly horizontal plane.

"Having now set out the principles upon which my improvement in the construction of tram roads, or rail-ways are founded, I desire it to be understood that I claim as the subject of my invention the forming of trams or rails, or lines of rails, or tram roads, in such an undulating curve or curves as will enable me to combine the advantages of momentum from gravity when running down the descending curves of hills, with the power of locomotive engines to be employed thereon; I do not confine myself to any particular extent of line, or form of curve, but vary and adapt the curve or curves according to the surface of the country, or the local circumstances."

[*Ibid.*

Patent granted to RICHARD WHYTOCK, *for an improved method or manufacture which facilitates the production of regular figures or patterns on different fabrics, particularly velvet, velvet pile, and Brussels, Wilton, or Turkey Carpets. Dated September* 18, 1832.

We have, at length, quitted the hardware and iron, which have been the subject of our previous notices, and find in Mr. Whytock's patent a matter of more interest, if not of more importance. The object the patentee has in view is to prevent waste, and to make the common loom applicable to all the purposes of what is called the figure loom.

Instead, therefore, of using a variety of different coloured yarns, either in the warp or woof of his velvet or carpet manufacture for the looping in the Wilton carpets, and for the knotting in the Turkey carpets, he uses but one yarn, all coloured at the same time, and by a process of some novelty.

He provides himself with a huge tumbril or cylinder, revolving on a horizontal axis like the common grindstone, (this is the patentee's own simile;) at the extremity of the axis is fastened a pulley, which corresponds with another pulley, secured to the wooden frame that

supports the cylinder. These are connected by an endless strap; and to the pulley in the frame is attached a regulating, or directing screw, the motion of which is simultaneous with that of the cylinder.

To the foot of the frame, and rising to the level of the outer disk of the cylinder, is a rack containing spindles, on which are placed reels of yarn, of the quality of which the carpet is to be composed, or for any other fabric. If the ground of the subject is to be white, the yarn on these reels is white; if of any other colour the yarn is dyed of that colour before it is wound on these reels. The cylinder is covered with a blanket, and then with an oil cloth, and the yarn for each spindle is drawn through loop holes of wire in the rack, and through eyes in the directing screw, or regulator; thence they are led to the cylinder, and carefully attached to the oil skin; the cylinder is then turned slowly and carefully until the yarn is wound on its whole surface, in suchwise that the threads shall lie as regularly as possible, not touching each other, and yet "*only not*" touching; as close almost as contact.

When the cylinder is quite filled with the yarn, the ends are again carefully fastened to the oil cloth, and colours are laid on by means of rulers, or spars buffed with felt, as used by the figure workers or block printers. The felt surfaces of these rulers are dipped in the colour sieve, as is well known to the operators, and it is laid on the yarn, as wound on the cylinder, at regulated distances and in exact proportions.

These proportions are to be ascertained only by a pattern paper, divided into squares, say seventy-four at top and one hundred and four down the side. On the paper thus squared out, is drawn the pattern; and the yarn on the cylinder, being the perpendicular lines, the transverse horizontal lines are marked down the side of the cylinder, as a kind of key. The operator then carefully observes, how many squares of his pattern are left blank, and these he leaves so. He then counts the number of squares in the first line that are to receive a colour, say light blue, and he then applies his ruler with the felt edge dipped in the colour, and so colours the yarn at once. When he has done this he turns the cylinder until the next numbers that require the colour are uppermost, and he again applies his felt ruler, and so on until the pattern is completed. The yarn is then taken off the cylinder on the oil cloth, which is removed at the same time, and when the colour has dried, the yarn is washed, and is afterwards exposed to the process of steam drying, according to the usual method. When all the yarn is thus prepared, it is beamed for the loom, and the woof is ready. The warp is prepared to correspond, and the whole process of carpet making, or of velvet weaving, proceeds in the common loom without the laborious manipulations, the waste, and the delay of the figure loom.

There is much of the process old, great part of it new, and the modification is altogether so. The patentee claims merely the means by which the common loom may be made to produce all the effects of the figure loom, particularly the cylinder, the colouring, and the directing rack. [*Rep. Pat. Inv.*

Patent granted to JOHN SWAN, *Brewer, for certain improvements in Brewing. Dated September* 29, 1832.

The object of this invention is to procure useful ingredients for brewing from hops which have already yielded their essence in the ordinary degree. The means of accomplishing this end is by a very high pressure, and by cutting and bruising the hops, in order that they may be subjected to repeated pressure. This effect may be produced in many ways. Mr. Swan proposes a press of very great power, to be secured in a room capable of being used as part of a brew house. The press must be strongly fixed to the floor. It works in a rim of proper material secured within another. From this outer circle proceeds a pipe to conduct the liquid expressed, from the hops into the proper receptacle.

The press is of great weight, and its bottom is convex, and scored in channels, as is the bottom of the vessel in which it works. These channels are to allow the liquid to pass off. The lever by which the press is raised may be worked by hand, or by machinery. The vessel being filled with hops which have undergone the usual process of brewing, the press is made to work upon them, and the liquor is forced off into the conducting pipe. Yeast is submitted to a pressure in the same manner, and forced into cakes for the convenience of keeping. The claim is for the very high pressure, and for this means of applying it. [*Ibid.*

Patent granted to GEORGE F. MUNTZ, *Metal Roller, for his invention of an improved manufacture of Metal Plates, for Sheathing the Bottoms of Ships and other Vessels. Dated October* 22, 1832.

The patentee takes, what is called in the market, the "best selected copper," and of zinc, that which is called in English commerce, "foreign zinc;" and these ingredients must be as fifty parts of copper to fifty parts of zinc, deviating according to the qualities of the ingredients, or to the purpose of the amalgamation, to sixty-seven parts of copper and thirty-three parts of zinc. The happiest medium between these extremes, according to the experience of the inventor, is of copper fifty-seven parts, and of zinc forty-three parts. If the zinc prevail, the metal is rather snappish than ductile; if the proportion of copper be exaggerated, the combination is apt to fuse in its after processes. Again, the quality of these ores will vary materially. You may mix copper and calamine, but you cannot then so readily decide on the proportions: brass, with a little addition of zinc, may be used also, but here again is less certainty. Between the extremes given, and about the medium suggested, the manufacturer will find by experience, that the nature of the different ingredients is most favourable to his purpose. When the new metal is produced by the combination mentioned, it is cast into ingots of different weights according to circumstances. These ingots are heated to a

red heat, and carried through the rollers: but with all circumspection, for if too much heated, there will be fusion; if allowed to grow cold the new amalgam cracks. If too hot, then do not roll it at all, for your labour will be wasted. Let it return to its own state. If too cold, roll it notwithstanding, but roll it thick, and then roll it again, when quite cold, with a cold roller.

The new metal, with such care in the process, works easily and cheaply: it is sufficiently flexible to adapt itself readily to the ship's outline, and it is more durable than the copper now used. It suffers less from oxidation, and yet it is oxidized enough to keep the vessel's bottom clean. The cheapness and utility depending, in a very great degree, on the skill with which it is attended to, wherein our British artists are so famous. [*Ibid.*

Patent granted to WILLIAM W. TAYLOR, *Felt Manufacturer, for his invention of an improved Cloth for the Sails of Ships and other Vessels. Dated November* 8, 1832.

The inventor observing that sails of flax or hemp invariably suffer from exposure to the moisture of the atmosphere and the wear of the waves, has set himself to invent a better material of which to make sails. In his own manufacture he found an article, little valued, except occasionally to be introduced in the composition of felt, sometimes to stuff upholstery articles with, and, much more generally, to be mixed with sand and lime in the making of mortar. The article is called in the markets, ox and cow hair. Of this hair the new fabric is wrought. The inventor takes of this material, and has it carded and combed as he would wool, so as to have the staple of the hair laying as straight as possible. The hair is spun precisely as wool, cotton, or flax. Hitherto this part of the process has been accomplished by hand, and the workwomen have found in it no difficulty. When the thread is made, the patentee recommends that it be doubled both for warp and woof. The two threads, twisted together, are woven in a hand loom, with all the facility of the common sail cloth. It is then fulled and milled so as to make the parts adhere, and to fill the interstices. The sails are sewed with the hair-thread, and thus the whole material is totally impervious to wet, insensible to damp, and will not suffer in any climate. The whole of the manufacture and the preparation are precisely correspondent with those of sail cloth as now used.

The patentee claims nothing in the machinery, or the mode of preparation; his part is the invention and application of such a fabric to such a purpose. Elk hair, deer hair, and the short straight pile of horse hair might be used; but the ox and cow hair of the market is cheaper and more plentiful. Mildew will not affect the sail, and it will stand the wind even better than canvass does.

[*Ibid.*

¶ List of French Patents.

A List of Patents for Inventions, Improvements, and the introduction of Foreign Inventions or Improvements, granted in France during the first quarter of the year 1832.*

[Continued from p. 115.]

[translated for this journal.†]

Peter Harris Abbot, of London, represented at Paris by M. de Moleon, March 28, (15 years.) For an improvement in the vaporization of liquids, applicable to the generation of steam and to other purposes. (P. Invent. and Improv.)

Jacques Marie Agneray, mechanician, at Roan, March 28, (5 years.) For a machine called a stretching and compressing bench, intended to be used in the preparatory processes in the spinning of cotton and other fibrous materials. (P. Invent.)

André Koechlin & Co. of Mulhausen, Department of the Upper Rhine, March 28, (5 years.) For a new method of spinning and twisting, by a continuous process, cotton, wool, or any other filamentous substance. (P. Improv.)

Ardaillon Bessy & Co. and John Lallier Forest, residing at Saint Etienne, Department of the Loire, March 9, (5 years.) For a process of manufacturing simultaneously a number of plain and damask bands, to be applied to the barrels of fowling pieces. (P. Invent.)

Ardaillon Bessy & Co. and John Lallier Forest, residing at Saint Etienne, department of the Loire, March 31, (5 years.) For an improved process for manufacturing simultaneously a number of plain and damask bands, to be applied to the barrels of fowling pieces. (P. Improv.)

John Anthony Arnaud, manufacturer of silk stuffs, at Lyons, January 23, (5 years.) For various processes intended to prevent the embezzlement of silk by the dyers. (P. Invent.)

John Anthony Arnaud, a clerk of Messrs. Royer & Co. at Saint Etienne, Department of the Loire, March 26, (5 years.) For certain economical methods of arranging the pasteboards which form the designs on the machines *à la Jacquart*. (P. Improv.)

John Baptiste Aubaud, Paris, March 9, (15 years.) For a machine for baking bread by stone coal. (P. Improv.)

Edward Baccuet, Paris, January 26, (5 years.) For a mechanical counter, intended to show the number of passengers who may have entered a public stage. (P. Invent.)

Edward Baccuel, Paris, February 29, (5 years.) For a mechani-

* In the following list P. Invent. denotes a patent for an invention. P. Invent. and Improv. a patent for invention and improvement. P. Improv. a patent for an improvement. P. Import. a patent for the importation, or introduction of a foreign invention. P. Import. Improv. a patent for introduction and improvements. P. Invent. Import. a patent for invention and importation.

† By request of the Committee on Publications.

cal counter, intended to show the number of passengers who may have entered a public stage. (P. Improv.)

Peter Bernard Barrau, Paris, March 16, (10 years.) For a handy, expeditious, and economical machine for sowing grain, &c. (P. Improv.)

Nicholas Francis Bert, Paris, January 9, (10 years.) For a portable steam bath. (P. Invent.)

Marcus Blanchon, jr. merchant and machine maker, at Chomerac, Department of Ardeche, January 14, (5 years.) For a mechanism which he calls *coupe-mariage*, for spinning silk without the aid of a reel. (P. Improv.)

John Baptist Baurges, sugar refiner, Bordeaux, March 28, (5 years.) For an apparatus for clarifying sirops. (P. Improv.)

Sylvan Toussaint Bourlet d' Amboise, agriculturalist, Paris, March 9, (5 years.) For the manufacturing of powdered *Rakachou*, and of the flower of the Asiatic sweet acorn, improved. (P. Import. and Improv.)

Sulpitius Christopher Breuzin, lamp maker, Paris, March 31, (5 years.) For an eolipile fed with spirits of wine, and affording a vertical jet of flame. (P. Invent. and Improv.)

Lewis Brurier, architect, Paris, March 28, (15 years.) For a hydraulic machine, called by him a Continual Hydrometer. (P. Improv.)

Christopher Francis Calla, engineer, mechanician, and founder, Paris, February 29, (5 years.) For improved spouts for carrying off water under the streets. (P. Invent. and Improv.)

John Baptist Cantier, suspender manufactory, Paris, February 11, (5 years.) For a new instrument to cut Indian rubber or caoutchouc, in its natural state. (P. Invent.)

John Claudius Chabert, philologist, and Lewis Legris, mechanician, Paris, March 14, (10 years.) For a portable windmill. (P. Improv.)

George Marcus Chapman, of New York, represented at Paris by M. Perpignan, February 13, (10 years.) For *antegazogenous* lamp sockets. (P. Import. and Improv.)

Mary Alexander Collet, lamp maker, Paris, March 26, (5 years.) For a carriage lamp which he calls Preservative Lamp. (P. Inven. and Improv.)

John Benjamin Coquatrix, suspender manufacturer at Roan, March 28, (10 years.) For a mechanism to be substituted for steam power, and to be applied to the same purposes. (P. Improv.)

Augustin Coront, silk dresser and trader residing at Lyons, March 31, (5 years.) For a new mechanism adapted to the dressing of raw silk. (P. Invent.)

Peter-es-Liens Courties, and Charles Lassere, physicians, Paris, January 31, (5 years.) For a rattle, intended to facilitate dentition, (P. Invent.)

Alexander Darlu, Paris, March 31, (10 years.) For a new machine which he calls a rotator. (P. Invent.)

John Simeon Delaroche, chimney builder, Paris, January 14, (5

years.) For a new hearth with circulation of air, and serving as an economical back log. (P. Invent and Improv.)

Peter Theophilus Delarue, lithographic printer, Paris, February 13, (5 years.) For a machine intended as a substitute for ventilators, by imparting a circular motion to the sky lights. (Patent Invent. and Improv.)

Augustus Delavelege, civil engineer, Paris, March 31, (10 years.) For a new lamp, by him called a Phœnix lamp. (P. Invent and Improv.)

Deroche and Magnin, merchants, Lyons, March 28, (5 years.) For pressed leather canteens, rendered impervious to water by a peculiar preparation. (P. Invent.)

Felix Nicholas Durand, machine maker at Somedienne, Department of the Meuse, January 14, (5 years.) For a powder flask and priming wire in one. (P. Invent.)

The Baron D'Est, Paris, February 22, (10 years.) For a new process of manufacturing all sorts of fire arms, as pistols, carbines, muskets, and a new kind of cartridge. (P. Invent and improv.)

Anthony Fayard, apothecary, Paris, January 23, (5 years.) For a new warming pan, heated by boiling water. (P. Improv.)

Edm. Nicholas P. Favreau, mechanical engineer, Paris, February 11, (15 years.) A machine for manufacturing the different kinds of paper. (P. Invent.)

Lewis Edward Feulard, Paris, February 13, (15 years.) For a machine to grind corn, and to pulverize various substances. (P. Invent and Improv.)

John Fontenelle, Paris, March 28, (5 years.) For employing metallic cloth in the manufacture of sieves for sifting corn. (P. Invent. and Improv.)

Lewis de Coblentz Gall, residing in Paris, January 23, (5 years.) For a warming and sudorific apparatus intended to warm the cold surfaces of a patient lying in his bed; to excite a prompt and copious perspiration, and also to communicate to the bed a perfume as well as warmth. (P. Invent. and improv.)

Peter John Gaudin, dyer, of Lyons, residing in Paris, March 26, (10 years.) For new processes of dying by mechanical means. (P. Invent and Improv.)

[TO BE CONTINUED.]

Account of an apparatus for maintaining a uniform temperature.

By GEORGE MERRYWEATHER, *Esq. of Whitby.*

(Read before the Royal Society of Edinburgh.)

I have the honour this evening of presenting to the Royal Society an apparatus which I hope will be the means of solving an important problem that has long remained an insurmountable obstacle in the path of science.

When the French chemists promulgated their nomenclature to the world, Fourcroy published the following:—

"Heat is now regarded only as an auxiliary agent, by which combinations are forwarded. As it is employed in different degrees, it would be a valuable acquisition if we knew how to apply it with uniform intensity. A furnace of this kind has long been a desideratum among chemists, and the manipulations of artists have hitherto been the only guide to the chemist, but it is impossible by this means to have the degree of precision so much to be desired."

It is nearly half a century since Fourcroy wrote the above, since which time the most gigantic progress has been made in science; yet this important point appears to have been lost sight of, or has been considered, like perpetual motion, an object never to be attained. Indeed, when we reflect that fires and furnaces are constantly consuming, and must be constantly renovated with fuel, and when we consider that flame must ever be in agitation, from the very atmosphere from which it derives its existence, it is not astonishing that all attempts should have proved futile, to arrive at a steady temperature, for a length of time, by these means.

The mode which I have made use of to arrive at the solution of the difficulty is quite novel, and will be best understood when the apparatus is before the Royal Society, when all the minutiæ can be explained.

In a philosophical point of view, I trust this apparatus will be considered interesting, as proving the fact that a uniform temperature *can* be steadily maintained in despite of external influences; and that it can be kept in constant operation, for an indefinite period, without requiring any one to attend to it.

It remains for scientific men to prove what its utility may be in chemistry and in pharmacy; and whether phenomena, at present unknown, may not be produced by submitting different substances for a length of time to the uniform temperature that this apparatus will maintain. Boerhaave first produced the red oxide by keeping mercury at the steadiest temperature he could procure for many weeks.

I rather anticipate an objection that may be made to this furnace, that is, the expense of the spirit consumed: but every one who has observed the constant attendance and watchings which every process requires where fire is employed, will easily perceive that what is expended in spirit will be more than economised in time. It will, I hope, be sufficiently obvious, that, in conducting experiments by this apparatus, there will be no fires to mend—no chimneys to sweep (as it causes no smoke;) and, from the precision of temperature, there will be no danger of explosions or boilings over. For instance, a practitioner may commence his process of distillation in the morning, he may attend to the calls of his profession, and be satisfied during his absence that all is going on steadily. But, as the expense of all processes is an important consideration, I have been induced to make the following calculation:—I find that one gallon of spirit, twenty-two over proof, which cost nine shillings from the distiller, will keep one of the balls incandescent for two months, night and day; or a fraction less than a penny for twelve hours. Three burners cause a temperature of 160 degrees of Fahrenheit; six produce a temperature

of 215 degrees; therefore, the expense of supporting the former for twelve hours will be 3d. and the latter 6d. The apparatus, which is at present before the Royal Society, has fifteen burners, elevating the temperature to nearly 396 degrees, making the expense 1s. 3d. for the same period.

I am indebted to Dr. Duncan, the Professor of Materia Medica, for suggesting to me the amount of temperature I have produced this evening before the Royal Society. And I have no doubt, if it had been necessary, I could have produced a temperature of 1000°; but I am informed that a heat of 300° to 350° is the most desirable temperature.

It perhaps will be expected that I should give an analytical account of the process of combustion, but this I leave with deference to the more refined chemist, and I will only venture the conjecture that it will be found, that the intense heat, produced by the employment of such small bodies, results from the combustion of oxygen and hydrogen by means of the spongy platina, and that water will be found to be the product, mingled with a portion of acetic acid, and derived from the spirit.

As my attention was first drawn to this subject by the writings of a French philosopher, I feel some degree of pleasure in thinking, that when this apparatus is made known to the scientific men in France and on the continent, it will be freed from the objection of expense, which, in this kingdom, may prove an obstacle, but, in other European states, the expense will be a mere bagatelle.

I do not present this furnace to the Royal Society as a perfect apparatus, because I am aware that it admits of various improvements and modifications. My sole object has been to produce a uniform and lasting temperature; and the means by which I have accomplished this, I have endeavoured to render as simple and as little expensive as possible.

GEORGE MERRYWEATHER.

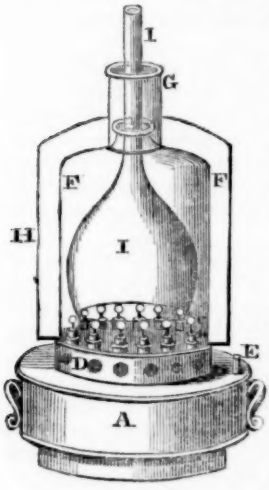
Explanation of the engraving of the apparatus for maintaining uniform temperature.

A, a reservoir made of tin, nine inches in diameter, concave at the bottom interiorly, and deep enough to hold one gallon of spirit. The hole at the side and lower part is to connect, by means of a tube, the reservoir with one containing a larger supply of spirit. This extra supply will be necessary when an experiment is to be conducted for a length of time.

B are the cotton wicks, which perforate fifteen brass tubes, each of which is similar to the brass work accompanying a common spirit lamp. When the wick is drawn through, it is to be spread and flattened. Each wick is to be sufficiently long to touch the bottom of the reservoir. The fifteen brass tubes are to be inserted into fifteen tin tubes, three quarters of an inch in diameter, which are soldered to the top of the reservoir; namely, twelve in a circle, and three in the

centre, the latter to be shorter and lower than the former, in order that a globular retort may approximate equally to each wick.

C is the platina wire, about the hundredth part of an inch in diameter, coiled into the form of a cup, the upper part of which is one-third of an inch in diameter; this cup is supported by a pin, formed by a continuation of the wire. A large headed common pin is pricked into the centre of the wick to make an opening for the insertion of the pin of the wire cup. The head of the large pin is then placed in the bottom of the cup to depress it, nearly in contact, but not to touch the wick. When all the coils of wire have been thus arranged, a piece of well compressed spongy platina is to be cut into small blocks of sufficient size to rest in each wire cup.



D is a rim soldered to the top of the reservoir, perforated with twelve holes, each three-quarters of an inch in diameter, for the admission of air.

E is a tin tube for supplying the reservoir with spirit.

F is a glass cover with a wide neck (this glass is precisely similar to the common deflagrating jars;) and rests upon a tin ledge, soldered inside round the rim D, above the air holes:

G is a tin tube or chimney, which rests upon the shoulders of the glass cover F.

H is a screen made of tin, which is large enough to surround the glass cover, and to leave a space an inch distant all round it. This screen is supported by a projecting rim of tin at the bottom on the same ledge that the glass cover F rests upon. It is advisable to have the interior surface of this screen lined with some material that is a bad conductor of heat.

I is a glass flask or retort, rounded at the bottom, which is placed upon a brass ring, supported by three legs. It is necessary to have all retorts that are used perfectly rounded at the lower part, in order that when the apparatus is adjusted, the retort may be at an equal distance, not to touch, but to be nearly in contact with each of the platina balls.

Belonging to the furnace is a tin cover, which is used when the apparatus is at rest. The screen and glass cover are withdrawn, and a tin cover is placed over all the burners, and rests upon the top of the reservoir, covering the rim perforated with air holes. The tin serves as an extinguisher, prevents the spontaneous evaporation of the spirit, protects the platina balls from injury, and preserves all clean. The whole of the tin work is japanned externally.

When an experiment is about to be performed, the tube G is taken off, then the screen H, afterwards the glass cover F. The wicks are

then to be saturated, by dropping strong alcohol upon each of them, after which they are to be lighted; in a few seconds the platina balls become red hot, the flame is then blown out, the retort, with its contents, is fixed on the brass stand, which is placed within the circle of the twelve burners. Then the glass cover, screen, and tube, are replaced as before.

The best and neatest mode of setting the apparatus into operation, is to render each of the platina balls incandescent, by means of the blow-pipe and spirit lamp; as soon as the balls are red hot the vapour of the spirit is ignited, and renders the dropping of stronger alcohol quite unnecessary. For this suggestion I am indebted to Professor Christison.

When it is wished to excite a lower degree of temperature, the experimenter has only to withdraw some of the brass tubes, in doing which he takes away at the same time the wicks and platina balls; corks must then be placed in the tin tubes, to prevent the unnecessary evaporation of the spirit. [*New Edinburgh Philos. Jour.*

Observations on competitions among working tradesmen. By Wm. Grierson, *Esq. of Garrock, W. S. member of the Society of Arts. Abridged from a paper read before the Society* 10*th April*, 1833, *and by their committee recommended to be printed.*

All of the useful arts admit of two distinct kinds of improvement. The one is by new inventions, the other by rendering workmen more expert.

The encouragement of invention has long been a favourite object with the public, and every one also is sensible of the importance of having operative tradesmen properly instructed; yet hardly any thing has ever been done towards attaining this last end, however desirable. Indeed, if we except the case of ploughmen, scarcely one class of the members who are employed in providing us with the necessaries of life, has ever had the stimulus of a prize for superior excellence held out to them, though there is not one among them to whom it might not be applied with perfect ease and with incalculable effect.

However varied and complicated a man's employment may be, a very few simple operations will suffice to show his merits. Thus, from the formation of a mortise and tenon, from the construction of a pannelled door, from the fitting of a drawer, the jointing of a leaf of a table, and one or two other such works, a perfect idea may be formed of the qualifications of all the various denominations of squaremen, in every stage of their progress. Each of these works might accordingly be assigned to a separate class of competitors, as the test of their advancement; and in every other trade a similar selection might be made, adapted to the various degrees of proficiency of its members. By these means some object of ambition might be placed within the reach of the youngest apprentice, while the most expert

workman would not find himself without rivals; and to preserve his pre-eminence, would be compelled to continue his exertions.

The details of such a system must of course be left to practical men; but there are one or two general principles which appear to apply universally, and which, indeed, seem quite necessary to the success of any attempt of the kind. 1. No class should be so large as not to afford a fair chance of success to every individual comprised in it; but that superior merit may obtain a corresponding distinction, the successful competitors in the first class should be brought again in competition with one another for an additional prize, just as in a coursing match. 2. That every one may know with whom he is to contend, the name of each competitor should be entered in a public list, a considerable time before the day of trial. 3. The work by which the merit of each class is to be ascertained, should, as far as possible, be executed in the same place, and at the same time, both to insure that no one shall produce any thing but what he has himself executed, and also for the purpose of comparing the different modes of doing the same thing, practised by different workmen. 4. That competitors may have complete assurance of perfect impartiality, they ought, in every case, to have the choice of their own judges. 5. It may be mentioned, in the last place, that books appear by far the best prizes that can be given, both on account of the valuable information which may be thus communicated, and also because a suitable inscription can be put upon them at no expense.

These principles of competition have already been tried with great success by the Glenkens Society, an institution which was formed about two years ago in a retired district of the Stewartry of Kirkendbright, for a similar purpose with that now under consideration: and there can be no doubt that competitions thus conducted, would be still more beneficial under the influence of the condensed population of a large town.

It has long been a general complaint among masters, that they find it next to impossible to fix the attention of their apprentices: that even their journeymen can hardly be prevailed upon to take an interest in their work beyond what is necessary to provide themselves with bread, and that the idle hours of both are grossly misspent. Indeed, so long as their utmost dexterity and skill can do so little towards raising them into public notice, we can hardly wonder that their work should hang so heavily on their hands; and that their relaxations should be of a kind of which we cannot approve. But were a ladder afforded to a working tradesman by which he might raise himself step by step from his obscurity to such a station as his talents and acquirements enable him to fill with credit to himself and benefit to the public; and were it made plain to him that whatever step he may at present occupy on this ladder, no great exertion would be required to gain one step higher, there cannot be a doubt that the emulation which has by similar means been excited among ploughmen, would be excited in him also, and in a much greater degree. The ordinary occupations of a workshop would become interesting to him as preparations to his public exhibitions; and the time during which he is not thus engaged,

would be employed by him in gaining some acquaintance with such branches of science as may be connected with his trade. This unquestionably would be the effect of these competitions on all the ablest men among these classes; and as it is from them that the whole take their tone, their example would be speedily followed. The community at large would become industrious and economical, and men who now sink through all the gradations of idleness and want, till they end in crime, would become active and useful members of society.

This would necessarily produce no inconsiderable diminution in the number of paupers, while it would at the same time tend to lessen the expense of all the necessaries of life. Every hand being improved to the utmost, and employed in the best possible way, would be rendered proportionably more productive, and as the most important inventions have almost all been made by working tradesmen, a very rapid addition to them might be confidently anticipated, from the prodigious force of the talent thus brought into operation, which is at present altogether dormant.

To these considerations it must be added, that the proposed competitions would do much towards establishing the connexion between the higher and lower classes, which, of late years, has been almost entirely done away, very much to the injury of both. Indeed, however anxious a rich man may now be to make himself useful to his poorer neighbours, he has it not in his power. He comes seldom into contact with any of them, but such as have already reduced themselves to beggary by idleness and dissipation, and, finding that any thing he may give them is worse than thrown away, he either abstains from charity altogether, or commits his contributions to some of the benevolent societies with which his country abounds. By them he is sure that his donations will be judiciously administered; but, when thus made they will do nothing towards securing him a place in the affections of the persons relieved, who, being unacquainted with their benefactor, cannot, of course, make to him any return of gratitude. But were the stamp of merit fixed on the really deserving by these competitions, a class of persons would be offered to the notice of the higher ranks, who would be every way deserving of their countenance. To them it would be given willingly and liberally. It would not fail to produce corresponding feelings of attachment and respect, and the various ranks would thus gradually become bound together by all those sympathies which enhance the joys, and sooth the sorrows of life. [*Ibid.*

¶ *Mr. Hancock's Steam Omnibus.*

Sir,—More than six years have elapsed since I began my experiments on steam locomotion; and I have followed it with an ardour that did not admit of any diversion from the grand object which I kept steadily in view. During the past week I have exhibited daily on the Paddington road a steam omnibus, the result of my experience;

and having hitherto carefully steered clear both of extravagant anticipations and exaggerated statements, I should be very sorry if any such should now find their way into the public prints. In order to prevent this, as far as I am able, I beg to hand you, for insertion in your wide-spreading miscellany, the following results of the first six days:—

April 22.—Started from cottage lane, City road, to Paddington, and from Paddington to London Wall, and back to Cottage lane—9¼ to 10 miles—1 hour, 8 minutes. Delays 18 minutes; travelling 50 minutes.

April 23.—From Cottage lane to Paddington and back to Cottage lane—8¼ miles—1 hour, 11 minutes. Delays 9 minutes; travelling 62 minutes.

April 24.—Same ground—1 hour 4 minutes. Delays 11½ minutes; travelling 53 minutes.

April 25.—Same ground and back as far as St. James' Chapel; piston broke.

April 26.—Same ground and back to Cottage lane—49 minutes. Delays 5 minutes; travelling 44 minutes.

April 27.—Same ground—50 minutes. Delays 5½ minutes; travelling 44½ minutes.

Average quantity of coke, one sack to each trip.

It is not intended to run this carriage more than about a week longer; partly because it was only intended as a demonstration of its efficiency, and partly because my own occupation will not admit of my personal attention to the steering, which I have hitherto performed myself, having no other person at present to whose guidance I could with propriety entrust it. During the time that it will require to build two more carriages for the Paddington Company, I shall have one or two others of my own running, which will afford me an opportunity for training steersmen, &c., for this road, which, of all others I am acquainted with, requires the greatest steadiness and attention.

I am, sir, your obedient servant,

Stratford, May 1, 1833. W. Hancock.

[*Mech. Mag.*

¶ *The Enterprise Steam Omnibus.*

Sir,—I hand you for insertion a continuation of the performance of the "Enterprise steam omnibus:—

	Miles.	Total Time.	Delays.	Travelling.
April 29, from City road to Paddington and back,	8½	51′	5½′	45½′
30,	,,	51	6½	44½
May 1, from City road to Paddington, thence round Finsbury square, and back to City road,	10	78	15	63
2,	,,	67	9	58

	Miles.	Total Time.	Delays.	Travelling.
May 3, ...	10	79′	18′	61′
4, ...	,,	70	12½	57½
6, ...	,,	65	8	57
7, from City road to Paddington, round Finsbury square, and thence to Paddington, where the welding of the centre of the crank shaft gave way; put on a collar and returned to city road.				
8, from City road round Finsbury square, and thence to Paddington; put in new fire bars.	At the former average speed.			
9, from Paddington to the bottom of City road, returned to Paddington, and back to City road.				

This journey concludes, for the present, the first series of operations of the "Enterprise," as stated in my last.

I expect to have one of my own carriages running daily in the course of the ensuing month, and a second in the month following, and trust that during the summer not less than four will be running in the neighbourhood of town, and that their performance will ensure to this mode of transit the patronage of the public.

I am, Sir, your obedient servant,

Stratford, May 13, 1833. W. Hancock.

[*Ibid.*

¶ *Liverpool and Manchester rail-way.*

We have more than once had occasion to notice the unfair attempts made by the partizans of canals in opposition to rail-ways, to represent the Liverpool and Manchester rail-way as an entire failure, as far as regards the conveyance of goods, and are now glad to be able to lay before our readers unanswerable evidence of the falsity of these representations. From the last half yearly Report of the Directors it appears that the success of the undertaking depends not on any single branch of business, but that each of the great divisions of the concern, the transit of passengers, of merchandise and coal, have severally, and largely, contributed to the revenues of the Company. The total quantity of merchandise conveyed along the line, in the six months ending the 31st December last, was 86,842 tons; the total quantity of coal 39,940 tons; and number of passengers 182,823. There were 3,363 trips of thirty miles performed with passengers. 1,679 with goods; and 211 with coals. The increase in merchandise during the last six months, as compared with the preceding half year,

was 7,821 tons, in coals 10,484 tons. One of the most prominent articles under the head of merchandise, is timber. In the five months preceding 31st December, no less than 2,297 tons were conveyed to Manchester; and excellent accommodations for the unloading of timber having been provided at the Manchester end, the Directors anticipate a very considerable increase of business in this department.

[*Ibid.*

New Vacuum Sugar.

The grains of this beautiful sugar are true and well formed crystals. They do not melt so readily as common sugar,—a circumstance that induces some inaccurate observers to imagine that this sugar is not so sweet as common muscovada. The taste is just that of fine *candy*. The advantage is that this sugar is far less hygrometric than common raw sugar, and suffers less from a moist atmosphere. The apparatus used in its preparation is a modification of the late Mr. Howard's apparatus for boiling sugar in *vacuo:* with strainers of copper plates pierced with minute holes, or several folds of wire gauze for clarifying the sirop. The process is, immediately on crushing the canes, to heat, lime, and scum, the juice, which, while warm, is forced through the strainer, from which it runs into the boiler. These are provided with air-tight covers, the tops of which are connected by tubes with a large air pump, wrought by a steam engine. The steam, as generated, is thus drawn off, and the boiling is thus carried on at a temperature far below the boiling point of sugar. When sufficiently concentrated, the sirop is crystallized, and when consolidated it is carried to the curing house, the temperature of which is kept up by steam pipes running into it. This process saves much sugar, for the heating being low, little or no molasses are formed, and a large quantity of sugar is obtained, which, in the old process, is converted into molasses. This apparatus was adopted by sugar-growers in Demerara, on the suggestion of a distinguished philosopher in Liverpool. The experiment has succeeded admirably; and the sugar bears a premium in the Liverpool market, especially when required for coffee.

[*New Edinburgh Philos. Jour.*

On the Prevention of Dry Rot.

At a meeting of the Royal Institution, after adverting to the extensive decay of wood in ships, houses, and other structures of that material, involving a loss of such magnitude as to have excited almost universal search after a remedy, Mr. Faraday said he should pass by all propositions for its prevention, except that one absolutely introduced by Mr. Ryan, and to which Mr. Faraday had paid particular attention. The process is now largely in use. The wood, prior to its application, is immersed in a solution of corrosive sublimate; in the course of a week, a load of it is found to have absorbed five gallons of solution, and at the end of that time it is removed, and shortly afterwards becomes fit for building. The preservative powers of

corrosive sublimate in furs, stuffed birds, anatomical specimens, &c., are well known; and those which it exerts over wood seem to be not less decisive, and far more useful. Pieces of timber thus prepared were put into a fungus pit at Woolwich for three years, and at the end of that time taken out perfectly sound. Canvass and calico, treated in a similar manner, were also found to be preserved from mildew and decay.

Mr. Faraday's suspicions appear to have been excited not so much as regarded the preservative power of the process, as by the healthiness of the wood, canvass, &c. impregnated by it; and he required that such prepared materials should be thoroughly washed, and then submitted to a test for proving the power of resisting decay. He found, after calico and canvass had been washed in water until all the solution which that fluid could remove, had disappeared, (mercury was still present,) such *prepared* materials were preserved in a damp cellar, while the *unprepared* went rapidly to decay. Having ascertained this combined state of the mercurial preparation, Mr. Faraday expressed his opinion that the organic substances could be well preserved by it without deriving any unwholesome quality to deteriorate their ordinary application. [*Ibid.*

¶ *Whitelaw's Improvement in Barker's Mill.*

Sir,—In reading over Mr. Scholefield's remarks on my improved form of Barker's mill, I perceive that his wrong ideas on the subject have arisen from his misunderstanding me. He thinks the mill is so constructed that the action of the water to turn it will be only on the concave surface of the outer curve of the arms. If I had intended *any* of the force of the water to be communicated to the mill in this way, I would not have taken *b f equal* to the distance that the extremity of the arms would pass over in the time that a particle of water moves from the centre of the mill to the extremity of the arms; I would have taken it *greater*. He is mistaken, too, when he thinks that there will be no force of reaction as the water leaves the mill, when the arms and jet holes have equal areas; there would be none if the water left the arms in a radial direction; but if he had examined the cut in p. 76 of the Journal, (the same as shown in p. 353 of your Magazine, last volume,) he would have seen that the ends of the arms are so shaped as to make the water flow from them in the line of a tangent to the circle described by the jet holes.

It was as early as the beginning of the year 1824, that I thought of giving the arms of Barker's mill the curve form. The Editor of the Glasgow Mechanics' Magazine takes notice of a communication of his correspondent, M. N., on the subject, in the number of that work for the 29th January, 1825; but a proper account of it was not published till I did it in the Journal of the Franklin Institute. My reasons for drawing the mill with a tube shaft, instead of having a packed joint close by the arms, are, 1st, that it makes a simpler and better understood drawing; 2nd, in some cases the tube shaft is the

best way for leading the water into the arms; and, 3d, any person who knows any thing at all about the mill, knows also about the packed joint, and could use it or not as he thought proper. I hope that the above, together with the fact that my account of the mill was published in the Journal of the Franklin Institute before his account was given in your Magazine, will satisfy your correspondent, $\phi.\mu.$

I take this opportunity for correcting three errors of the press in my former communication on this subject. In the 17th line from the top of the 74th page of the Journal of the Franklin Institute, (vol. x.) for "*upper stone*" read "*aperture;*" and in the 39th line of the same page, "*a* to *h*," should read "*a* to 2;" then, two lines below this, for "4" read "3." These errors are continued in your Magazine; the first, in the 5th line from the bottom of the 354th page; the second in the 16th line from the top of the same page, and the third two lines below it.

As the Editor of the Journal of the Franklin Institute occasionally makes extracts from the Mechanic's Magazine, if he thinks proper he can copy my remarks on the observations made by Mr. Scholefield on my form of Barker's mill, into his Journal.

I am, Sir,
Your obedient servant,

Glasgow, June 15, 1833. JAMES WHITELAW.

[*Mech. Mag.*

¶ POPULAR SCIENCE.

No. IV.

Selections from Letters on Natural Magic.
By Sir DAVID BREWSTER.

An individual raised on the fingers of four other persons.

One of the most remarkable and inexplicable experiments relative to the strength of the human frame which you have yourself seen and admired, is that in which a heavy man is raised with the greatest facility, when he is lifted up the instant that his own lungs and those of the persons who raise him are inflated with air. This experiment was, I believe, first shown in England a few years ago, by Major H. who saw it performed in a large party at Venice under the direction of an officer of the American navy. As Major H. performed it more than once in my presence, I shall describe as nearly as possible the method which he prescribed. The heaviest person in the party lies down upon two chairs, his legs being supported by one and his back by the other. Four persons, one at each leg, and one at each shoulder, then try to raise him, and they find his dead weight to be very great, from the difficulty they experience in supporting him. When he is replaced in the chair, each of the four persons takes hold of the body as before, and the person to be lifted gives two signals by clapping his hands. At the first signal he himself and the four lifters

begin to draw a long and full breath, and when the inhalation is completed, or the lungs filled, the second signal is given for raising the person from the chair. To his own surprise and that of his bearers, he rises with the greatest facility, as if he were no heavier than a feather. On several occasions I have observed that when one of the bearers performs his part ill, by making the inhalation out of time, the part of the body which he tries to raise is left, as it were, behind. As you have repeatedly seen this experiment, and have performed the part both of the load and of the bearer, you can testify how remarkable the effects appear to all parties, and how complete is the conviction, either that the load has been lightened, or the bearer strengthened by the prescribed process.

At Venice the experiment was performed in a much more imposing manner. The heaviest man in the party was raised and sustained upon the points of the forefingers of six persons. Major H. declared that the experiment would not succeed if the person lifted were placed upon a board, and the strength of the individuals applied to the board. He conceived it necessary that the bearers should communicate directly with the body to be raised. I have not had an opportunity of making any experiments relative to these curious facts; but whether the general effect is an illusion, or the result of known or of new principles, the subject merits a careful investigation.

Exposure of the body to high degrees of heat.

The kindred art of walking on burning coals, or red hot iron, remounts to the same antiquity. The priestesses of Diana at Castabala in Cappadocia were accustomed, according to Strabo, to walk over burning coals; and at the annual festival which was held in the temple of Apollo on Mount Soracte in Etruria, the Hirpi marched over burning coals, and on this account they were exempted from military service, and received other privileges from the Roman senate. This power of resisting fire was ascribed even by Varro to the use of some liniment with which they anointed the soles of their feet.

Of the same character was the art of holding red hot iron in the hands or between the teeth, and of plunging the hands into boiling water or melted lead. About the close of the seventeenth century, an Englishman of the name of Richardson rendered himself famous by chewing burning coals, pouring melted lead upon his tongue, and swallowing melted glass. That these effects are produced partly by deception, and partly by a previous preparation of the parts subjected to the heat, can scarcely admit of a doubt. The fusible metal composed of mercury, tin, and bismuth, which melts at a low temperature, might easily have been substituted in place of lead; and fluids of easy ebullition may have been used in place of boiling water.

But even when the fluid requires a high temperature to boil, it may have other properties which enable us to plunge our hands into it with impunity. This is the case with boiling tar which boils at a

temperature of 220 degrees, even higher than that of water. Mr. Davenport informs us, that he saw one of the workmen in the king's dock yard at Chatham, immerse his naked hand in tar of that temperature. He drew up his coat sleeves, dipped in his hand and wrist, bringing out fluid tar, and pouring it off from his hand as from a ladle. The tar remained in complete contact with his skin, and he wiped it off with tow. Convinced that there was no deception in this experiment, Mr. Davenport immersed the entire length of his fore-finger in the boiling caldron, and moved it about a short time before the heat became inconvenient. Mr. Davenport ascribes this singular effect to the slowness with which the tar communicates its heat, which he conceives to arise from the abundant volatile vapour which is evolved, "carrying off rapidly the caloric in a latent state, and intervening between the tar and the skin, so as to prevent the more rapid communication of heat." He conceives also that when the hand is withdrawn, and the hot tar adhering to it, the rapidity with which this vapour is evolved from the surface exposed to the air, cools it immediately. The workmen informed Mr. Davenport that if a person put his hand into the caldron with his glove on, he would be dreadfully burnt; but this extraordinary result was not put to the test of observation.

But though the conjurers with fire may have availed themselves of these singular properties of individual bodies, yet the general secret of their art consisted in rendering the skin of the exposed parts callous and insensible to heat,—an effect which may be produced by continually compressing or singeing them till the skin acquires a horny consistence. A proof of this is mentioned by Beckmann, who assures us that in September, 1765, when he visited the copper works at Awestad, one of the workmen, bribed by a little money to drink, took some of the melted copper in his hand, and after showing it to the company, threw it against a wall. He then squeezed the fingers of his horny hand close to each other, held it a few minutes under his arm-pit to make it perspire, as he said, and taking it out again, drew it over a ladle filled with melted copper, some of which he skimmed off, and moved his hand backwards and forwards very quickly by way of ostentation. During this performance, M. Beckmann noticed a smell like that of singed horn or leather, though the hand of the workman was not burned. This callosity of the skin may be effected by frequently moistening it with dilute sulphuric acid. Some allege that the juices of certain plants produce the same effect, while others recommend the frequent rubbing of the skin with oil. The receipt given by Albertus Magnus for this purpose was of a different nature. It consisted of a non-conducting calcareous paste, which was made to adhere to the skin by the sap of the marsh mallow, the slimy seeds of the flea-bane, and the white of an egg.

Spontaneous Combustion.

So recently as 1744 a similar example of spontaneous combustion occurred in our own country at Ipswich. A fisherman's wife of the name of Grace Pett, of the parish of St. Clements, had been in the habit for several years of going down stairs every night after she was half undressed to smoke a pipe. She did this on the evening of April 9th, 1744. Her daughter, who lay in the same bed with her, had fallen asleep, and did not miss her mother till she awaked early in the morning. Upon dressing herself, and going down stairs, she found her mother's body, laying on the right side, with her head against the grate, and extended over the hearth with her legs on the deal floor, and appearing like a block of wood burning with a glowing fire without flame. Upon quenching the fire with two bowls of water, the neighbours, whom the cries of the daughter had brought in, were almost stifled with the smell. The trunk of the unfortunate woman was almost burned to ashes, and appeared like a heap of charcoal covered with white ashes. The head, arms, legs, and thighs, were also much burned. There was no fire whatever in the grate, and the candle was burned out in the socket of the candlestick, which stood by her. The clothes of a child on one side of her, and a paper screen on the other, were untouched; and the deal floor was neither singed nor discoloured. It was said that the woman had drunk plentifully of gin overnight in welcoming a daughter who had recently returned from Gibraltar.

Fluids in the Cavities of Minerals.

In examining with the microscope the structure of mineral bodies, I discovered in the interior of many of the gems, thousands of cavities of various forms and sizes. Some had the shape of hollow and regularly formed crystals; others possessed the most irregular outline, and consisted of many cavities and branches united without order, but all communicating with each other. These cavities sometimes occurred singly, but most frequently in groups, forming strata of cavities at one time perfectly flat and at another time curved. Several such strata were often found in the same specimens, sometimes parallel to each other, at other times inclined, and forming all varieties of angles with the faces of the original crystal.

These cavities, which occurred in sapphire, chrysoberyl, topaz, beryl, quartz, amethyst, peridot, and other substances, were sometimes sufficiently large to be distinctly seen by the naked eye, but most frequently they were so small as to require a high magnifying power to be well seen, and often they were so exceedingly minute that the highest magnifying powers were unable to exhibit their outline.

The greater number of these cavities, whether large or small, contain two new fluids different from any hitherto known, and possessing remarkable physical properties. These two fluids are in general

perfectly transparent and colourless, and they exist in the same cavity in actual contact, without mixing together in the slightest degree. One of them expands *thirty* times more than water, and at a temperature of about eighty degrees of Fahrenheit, it expands so as to fill up the vacuity in the cavity. When heat such as that of the hand is applied to the specimen, the vacuity gradually contracts in size, and wholly vanishes at a temperature of about eighty degrees.

When the cavities are large compared with the quantity of expansible fluid, the heat converts the fluid into vapour, an effect which is shown by the circular cavity becoming larger and larger till it fills the whole space.

When any of these cavities, whether they are filled with fluid or with vapour, are allowed to cool, the vacuity reappears at a certain temperature. In the fluid cavities the fluid contracts, and the small vacuity appears, which grows larger and larger till it resumes its original size. When the cavities are large, several small vacuities make their appearance and gradually unite into one, though they sometimes remain separate. In deep cavities, a very remarkable phenomenon accompanies the reappearance of the vacuity. At the instant that the fluid has acquired the temperature at which it quits the sides of the cavity, an effervescence or rapid ebullition takes place, and the transparent cavity is for a moment opaque, with an infinite number of minute vacuities, which instantly unite into one, that goes on enlarging as the temperature diminishes.

Having fallen upon a method of opening the cavities, and looking at the fluids, I was able to examine their properties with more attention. When the expansible fluid first rises from the cavity upon the surface of the topaz, it neither remains still like the fixed oils, nor disappears like evaporated fluids. Under the influence, no doubt, of heat and moisture, it is in a state of constant motion, now spreading itself on a thin plate over a large surface, and now contracting itself into a deeper and much less extended drop. These contractions and extensions are marked by very beautiful optical phenomena. When the fluid has stretched itself out into a thin plate, it ceases to reflect light, like the thinnest part of the soap bubble, and when it is again accumulated into a thicker drop, it is covered with the coloured rings of thin plates.

After performing these motions, which sometimes last for ten minutes, the fluid suddenly disappears, and leaves behind it a sort of granular residue. When examining this with a single microscope, it again started into a fluid state, and extended and contracted itself as above. This was owing to the humidity of the hand which held the microscope, and I have been able to restore by moisture the fluidity of these grains twenty days after they were formed from the fluid. This portion was shown to the Rev. Dr. Fleming, who remarked, that had he observed it accidentally, he would have ascribed its apparent vitality to the movements of some of the animals of the genus Planaria.

After the cavity has remained open for a day or two, the dense fluid comes out and quickly hardens into a transparent and yellowish

resinous looking substance, which absorbs moisture, though with less avidity than the other. It is not volatilized by heat, and is insoluble in water and alcohol. It readily dissolves, however, with effervescence in the sulphuric, nitric, and muriatic acids. The residue of the expansible fluid is volatilized by heat, and is dissolved, but without effervescence in the above mentioned acids. The refractive power of the dense fluid is about 1.295, and of the expansible one 1.131.

The particles of the dense fluid have a very powerful attraction for each other, and for the mineral which contains them, while those of the expansible fluid have a very slight attraction for one another, and also for the substance of the mineral. Hence the two fluids never mix, the dense fluid being attracted to the angles of angular cavities, or filling the narrow necks by which two cavities communicate. The expansible fluid, on the other hand, fills the wide parts of the cavities, and in deep and round cavities it lies above the dense fluid.

When the dense fluid occupies the necks which join two cavities, it performs the singular function of a fluid valve, opening and shutting itself according to the expansions or contractions of the other fluid. The *fluid valves* thus exhibited in action may suggest some useful hints to the mechanic and the philosopher, while they afford ground of curious speculation in reference to the functions of animal and vegetable bodies. In the larger organizations of ordinary animals, where gravity must in general overpower, or at least modify, the influence of capillary attraction, such a mechanism is neither necessary nor appropriate; but, in the lesser functions of the same animals, and in almost all the microscopic structures of the lower world, where the force of gravity is entirely subjected to the more powerful energy of capillary forces, it is extremely probable that the mechanism of immiscible fluids, and fluid valves, is generally adopted.

In several cavities in minerals I have found crystallized and other bodies; sometimes transparent crystals, sometimes black spicular crystals, and sometimes black spheres, all of which are movable within the cavity. In some cavities the two new fluids occur in an indurated state, and others I have found to be lined with a powdery matter. This last class of cavities occurred in topaz, and they were distinguished from all others by the extraordinary beauty and symetry of their form. One of these cavities represented a finely ornamented sceptre, and, what is still more singular, the different parts of which it is composed lay in different planes.

When the gem which contains the highly expansive fluid is strong, and the cavity not near the surface, heat may be applied to it without danger, but in the course of my experiments on this subject, the mineral has often burst with a tremendous explosion, and in one case wounded me on the brow. An accident of the same kind occurred to a gentleman, who put a crystal into his mouth for the purpose of expanding the fluid. The specimen burst with great force, and cut his mouth, and the fluid which was discharged from the cavity had a very disagreeable taste.

In the gems which are peculiarly appropriated for female ornaments,

cavities containing the expansible fluid frequently occur, and if these cavities should happen to be very near the surface or the edge of the stone, the fever heat of the body might be sufficient to burst them with an alarming and even dangerous explosion. I have never heard of any such accident having occurred; but if it has, or if it ever shall occur, and if its naturally marvellous character shall be heightened by any calamitous results, the phenomena described in the preceding pages will strip it of its wonder.

Meteorological Observations for July, 1833.

Moon.	Days.	Therm. Sun rise.	Therm. 2 P. M.	Barometer. Sun rise.	Barometer. 2 P. M.	Dew point	Wind. Direction.	Wind. Force.	Water fallen in rain.	State of the weather, and Remarks.
				Inches	Inches				Inches.	
☉	1	63°	87°	29.95	29.95	67°	W. SW.	Moderate.		Light clouds—clouds.
	2	68	89	.90	.80	67	SW.	Brisk.		Fog—clear.
	3	66	69	.70	.70	57	W.	Moderate.		Rain—cloudy.
	4	58	74	.80	.90	54	W.	Brisk.		Clear day.
	5	56	74	30.10	30.10	50	W.	Moderate.		Clear day.
	6	53	79	.10	.10	53	W.	do.	0.06	Clear—shower in night.
	7	69	84	29.94	29.90	70	W.	Brisk.		Cloudy—flying clouds.
	8	66	85	.90	.80	71	W.	do.		Clear—flying clouds.
	9	72	82	.70	.70	65	W.	do.	0.30	Rain—clear.
☽	10	58	79	.94	.94	51	W.	Moderate.		Clear—Aurora Borealis.
	11	60	82	.84	.70	55	W.	Brisk.	0.45	Clear—thunder shower.
	12	64	82	.70	.80	55	W.	Moderate.		Clear day.
	13	70	89	.90	.90	70	W.	do.		Cloudy—clear.
	14	73	90	.90	.90	76	W.	Brisk.	1.53	Clear—flying clouds—thunder
	15	66	81	.90	.93	56	W.	Moderate.		Clear day. [shower.
	16	58	68	.85	.85	48	W.	Brisk.		Clear day.
	17	64	74	.85	.80	60	SE.	Moderate.		Cloudy—flying clouds.
	18	59	77	.95	30.00	52	W.	do.		Clear day.
	19	58	76	30.10	.10	54	W.	do.	0.09	Clear—cldy—shower in nt.
	20	64	82	.100	.100	66	W.	do.		Cloudy—clear.
	21	66	84	.05	.05	72	W.	do.		Cloudy—flying clouds.
	22	69	92	.00	.00	76	SE. W.	do.		Fog—clear.
	23	72	86	.00	.00	60	SE. W.	do.		Clear day.
	24	68	90	29.90	29.90	76	SW.	do.	0.09	Cloudy clear. thunder show.
	25	72	74	30.00	30.00	67	NE.	do.		Cloudy day. [cr. high wind
	26	63	80	.10	.10	59	NE.	do.		Clear day.
	27	62	85	30.00	30.00	70	SW.	do.		Clear day.
	28	59	82	30.00	30.00	67	NW.	Breeze.		Clear day.
	29	70	79	29.90	29.85	61	NW.	Moderate.		Clear day.
	30	72	80	29.70	29.65	72	S.	do.	0.95	Cloudy—shower.
☾	31	58	73	.70	.80	50	W.	do.		Clear day.
	Mean	64.51	80.61	29.89	29.89	60.4			2.97	

	Thermometer.	Barometer.
Maximum height during the month,	92. on 22nd.	30.10 on 5th, 6th, 19th, 26th, 27th.
Minimum do.	53. on 6th.	29.33 on 15th.
Mean do.	72.56	29.89